American Machinist

APRIL 7, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Fresh Approach To Replacement

page 90

Instrumentation makes a plain grinder hold ±10 millionths—see page 126

- **Screw machine parts from a drillpress,** page 92
- **Who speaks for small business?,** page 98
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it's mainly a matter of TIMING!

WHEN to replace a machine can mean the difference between profit and loss

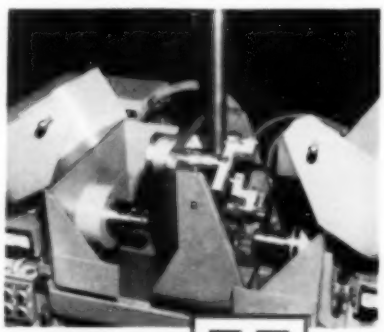
TOO EARLY is just as bad as too late. But somewhere in between there's a mathematically determinable *right time* to retire that old machine and replace it with a new one. A time when this replacement works out to your best advantage from the standpoint of production cost and capital investment.

Guess-work, intuition or rule-of-thumb computations usually come up with the wrong answer. And even carefully conceived "obsolesence formulas" may have their pitfalls. Because incorrect replacement timing, one way or the other, can *waste* thousands of dollars, this problem is of vital concern to all industry.

But Heald can help you solve it. Our sales engineers are well experienced in precise methods of replacement analysis. If you're in doubt, or would like to check your own computations, call in your Heald engineer. He will be glad to help you determine the right time to replace. And if now is too soon, he will tell you so. Similar cost studies by Heald engineers have pointed the way to many substantial savings.

For example: This new Heald Model 322 Bore-Matic replaced a heavy-duty drill for boring and chamfering hydraulic-cylinder piston rods. A cost analysis determined that the investment in a new machine could not be deferred any longer without serious financial loss. As verified by subsequent operation, the new machine offered the following savings:

	Old Machine	New Machine
Parts per hour	11	24
Machine load, per year	3,080 hrs.	1,380 hrs.
Direct & Indirect Labor	9,480 hrs.	3,240 hrs.
Annual Maintenance	$356	$100
Annual Operating Cost	$27,800	$15,000
Annual Saving, New Machine		$12,800
Net Return on Investment		39.6%



YOU pay for obsolesence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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American Machinist chips

Added Trend... An important addition is made to the trend pages in this issue. It is Materials Trends, page 75. We have found increasing interest among production people not only in the new materials that are available, but in the new applications of old materials and the trends in applying materials. This page will put the whole field of materials and components in perspective for production men.

Fresh Approach... You may think you've heard everything that can be said about justifying the purchase of new machines. But you'll find an entirely new approach on page 90, telling how a company financed purchases out of the savings in inventory that the new equipment made possible. It starts a series of articles on unusual approaches to the problem of "Tooling To Beat Competition."

Building Block Trend?... A rather startling development in the building-block controversy is reported this week with the first announcement of a builder of special machinery switching to the manufacture of standard building-block units. The story is in our News Report pages.

Coming... *AM* for April 21 will be the Tool Show Issue. You'll find a complete guide to help you make the most of your time at the Show. Plus a Special Report on automatic loading and unloading for machine tools, and a collection of articles that concentrate on the latest developments in tooling. They will include tooling for machining beryllium, machining superalloys, hard hobbing, ceramics, and universal tooling for broaching operations. This is an issue that is a real must.

Elton Barrett says his background is not very spectacular and then proceeds to disprove the statement by mentioning that in his spare time he is building his own house. Mr Barrett was a paint chemist, then an electronic engineer, then a patent attorney. In 1954, he gave up law practice to become president of CGS. From 37 employees in '54 it has grown to 120 with an annual volume of over $1 million. From his experience at the head of this small business, Mr Barrett lashes out at the sacred cows of small business in his article on page 98.

Cover...

Pistons and bores can be held to ±20 millionths with Brown & Sharpe's new Ceda Size control on a plain grinder. See page 126.

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.

American Machinist, published bi-weekly, with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd St, New York 36, NY. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited only from production executives and engineers in the metalworking industries. **Position and company connection must be indicated on subscription orders.**

Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY

United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 75 cents, foreign $25.00 per year, payable in advance. Second-class mail privileges authorized at New York, NY. Printed in USA. Title registered in U S Patent Office.

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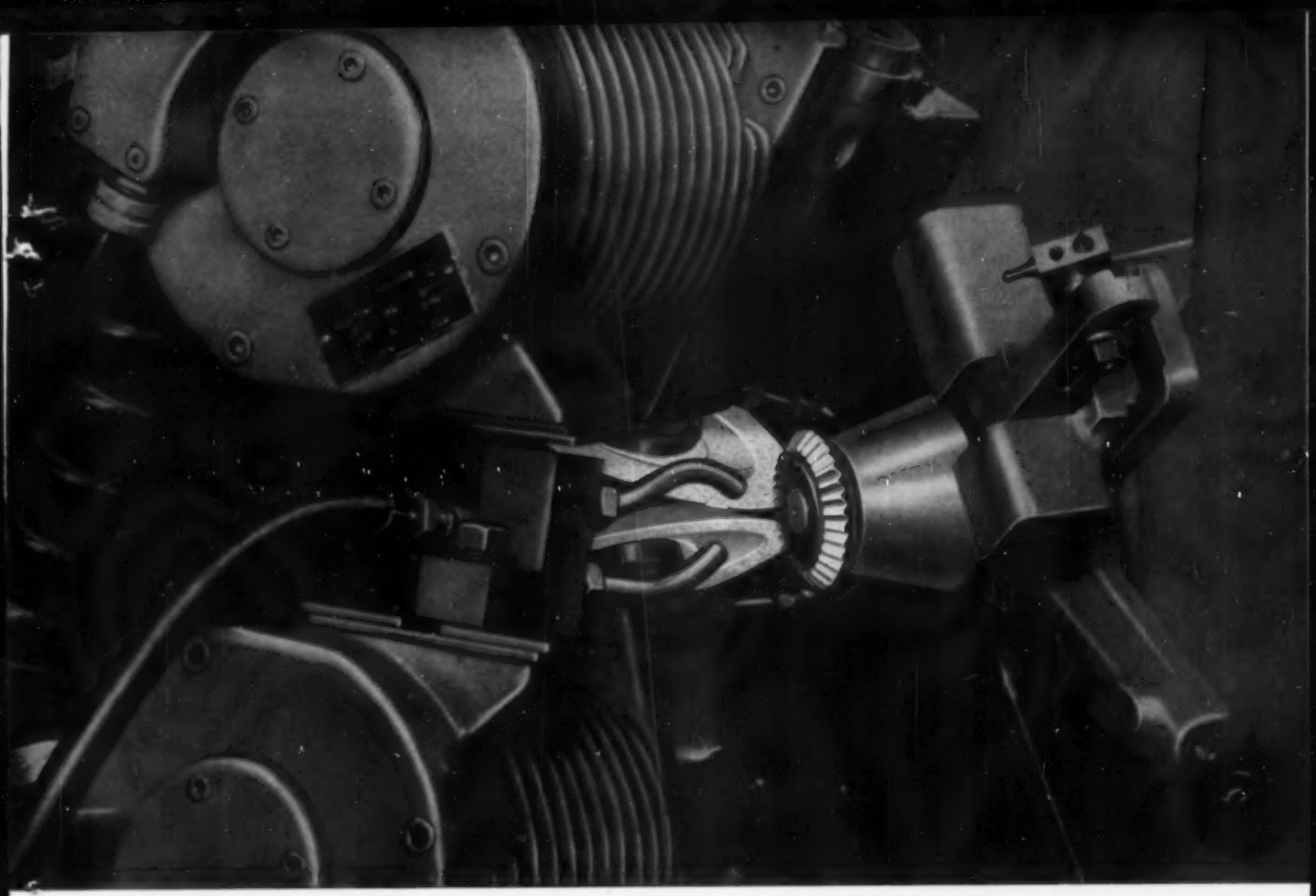


Now you can grind straight bevel Coniflex® gears

You can *now* use hardened and ground straight bevel gears for many angular drives requiring extreme precision and load carrying capacity.

The new Gleason No. 105 Straight Bevel Coniflex* Grinder generates gears with the highest accuracy of spacing and profile, with the tooth profile, fillet radius, and tooth bottom formed into one smooth blended shape by two grinding wheels.

And gears ground on the No. 105 Grinder after hardening *maintain their extreme precision* even under continuous load operation.

Wet-type grinding on this machine provides fast cycles and excellent finish. Set-up calculations are simple. The completely automatic cycle of the No. 105 Grinder not only assures uniformity of production but also provides great savings in time and production costs.

We will gladly send you more information about the No. 105 Straight Bevel Coniflex Grinder upon request.

The No. 105 Grinder accommodates straight bevel Coniflex gears up to 8½" pitch diameter, 3DP with ratios up to 6:1, cone distances up to 4¼". Gears 20DP and finer may be ground directly from the solid; coarser pitches are ground after semi-finish cutting and hardening.

*Straight bevel gears with localized tooth bearing.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

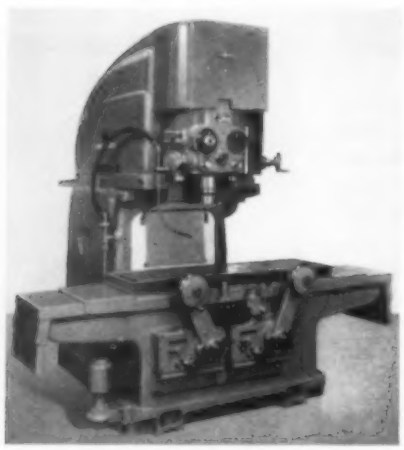
1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

To Profile Mill Slots in Cylindrical Surfaces . . .

Coordinates Straight Line and

Milling a variable pitch slot in a cylindrical surface is no longer the costly toolroom job it once was. Cincinnati Milling Specialists have given the operation a production status by coordinating straight line and rotary motions. The 360 Degree Automatic Tracing Unit, which may be supplied with CINCINNATI Hydro-Tel Milling Machines, handles the coordination job with no attention whatever from the operator. The machine table is disconnected from the hydraulic system and locked in position. Cross feed of the ram, as always, is controlled by the Automatic Tracing Unit. This unit, through a hydraulic cylinder and rack and pinion arrangement, also controls rotary feed of the fixture cradles holding the work and master. The combination of these two feed motions produces smooth, accurate slots in the internal arc of the part illustrated at the right. ¶CINCINNATI Hydro-Tel Milling Machines have the potential for many types of unusual tracer controlled milling operations. And Cincinnati Engineering Service is ready to help you with the tooling problems, or prepare a cost analysis of your present equipment and methods versus a new Cincinnati production package. May we hear from you?

Slots in internal arc of this part are automatically profile milled on the CINCINNATI equipped 16" Vertical Hydro-Tel illustrated at the right. Time per operation, including rough and finish cuts, about 18 minutes.



CINCINNATI

CINCINNATI 16" Vertical Hydro-Tel Milling Machine.
Catalog No. M-1497-1.

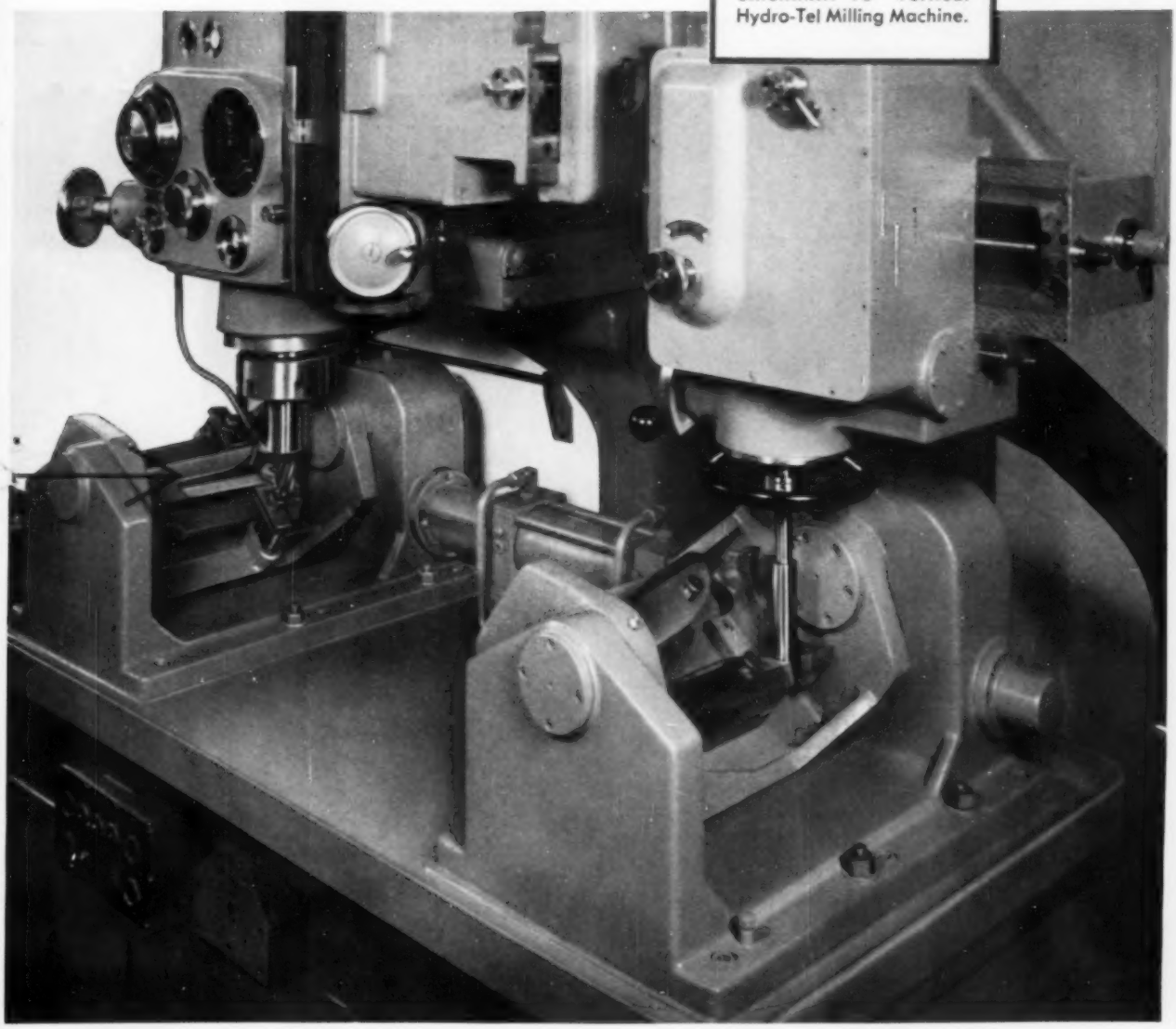
CINCINNATI®

MILLING MACHINES • BROACHING MACHINES • CUTTER METAL FORMING MACHINES • HARDENING MACHINES •

Hydro-Tel's 360° Automatic Tracing Unit

Rotary Motions

Rotary feed motion of trunion-mounted work and master cradles is coordinated with cross feed of ram by 360° Automatic Tracing Unit mounted on CINCINNATI 16" Vertical Hydro-Tel Milling Machine.



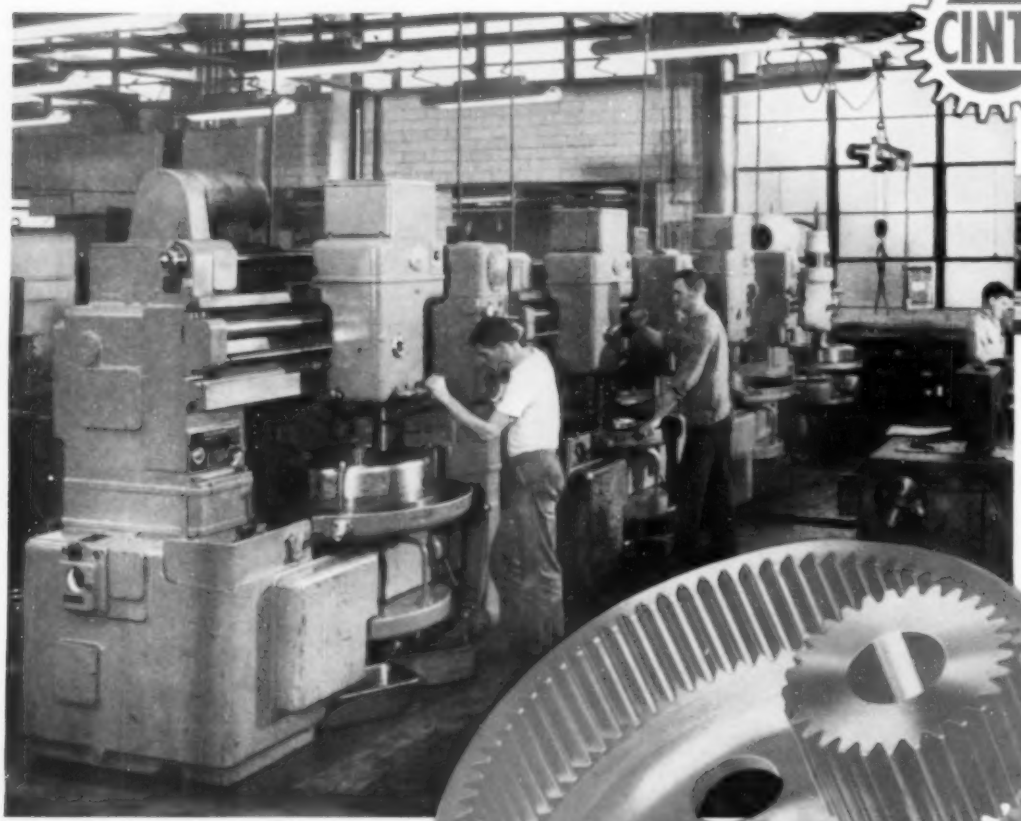
AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

FELLOWS
36-TYPE GEAR SHAPERS cut

CINTI®

at



Foreground: one of three 36-Type Gear Shapers cutting a large internal gear for a major road equipment manufacturer.

THE PRECISION LINE

Production Costs

CINCINNATI GEAR

One of the leading custom gear manufacturers in the country, The Cincinnati Gear Company relies on the most modern equipment in every department to maintain their reputation for producing high quality gears. Outstanding breadwinners, in a shop familiar with every type of gear production machine, are their Fellows 36-Type Gear Shapers.

Fellows "36-Type" is fast and simple to set up, whether for 10 or 100 gears, for internal or external spurs, helicals, and herringbones up to 36" P.D. and 6" face width. Thanks to its rugged design and construction, it holds close tolerances even while taking extra heavy cuts at cutting speeds ranging from 18 to 300 strokes per minute. Its versatility makes it possible to cut cams, splines, and special contours, too.

For full information about the Fellows 36-Type Gear Shaper and its production advantages, get in touch with your Fellows representative. Ask him, too, about the Fellows Plans for deferred payment. Just call any Fellows office.

THE FELLOW GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*

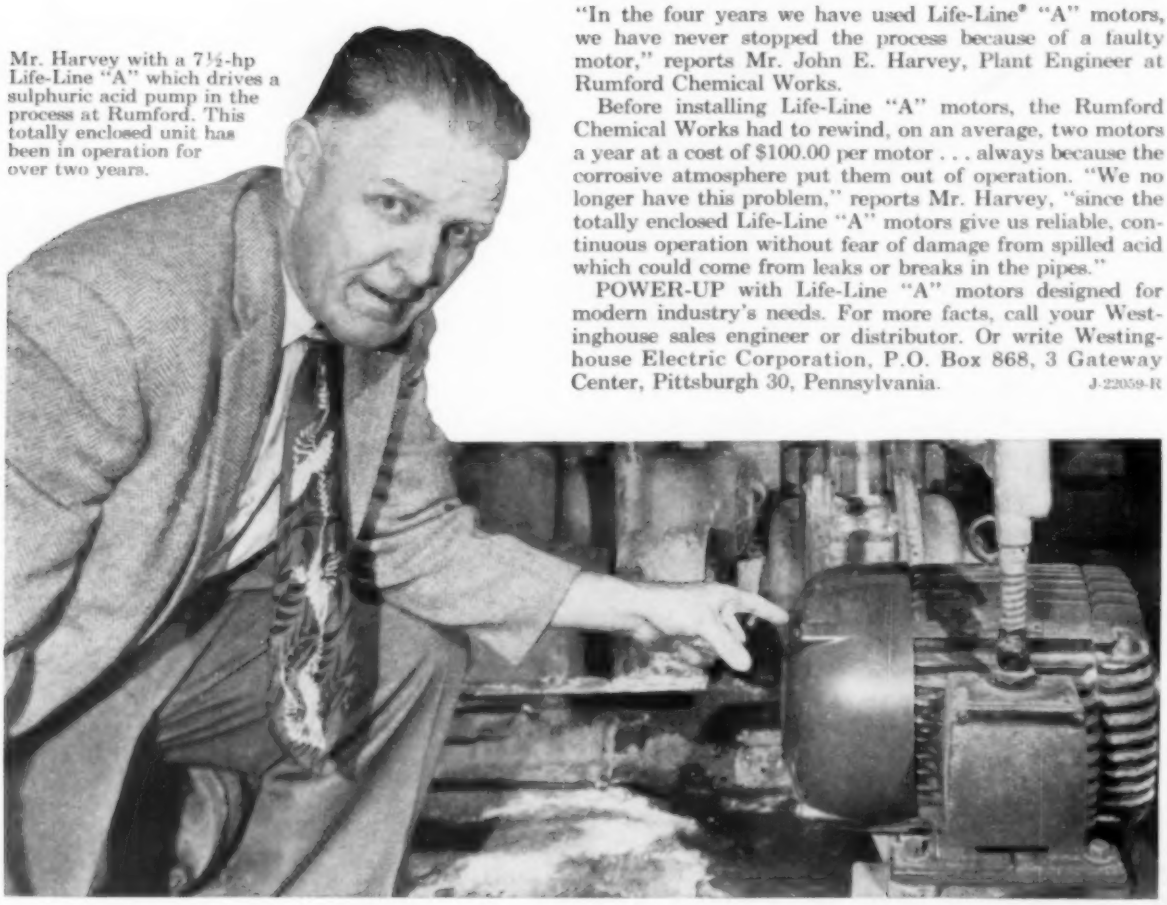
ANOTHER IN A SERIES

Westinghouse Life-Line "A" motors save $200 a year in rewinding costs alone

...at Rumford Chemical Works, Rumford, R.I.

Westinghouse motors are reliable for 24-hour, 7-day week operation in sulphuric acid manufacture

Mr. Harvey with a 7½-hp Life-Line "A" which drives a sulphuric acid pump in the process at Rumford. This totally enclosed unit has been in operation for over two years.



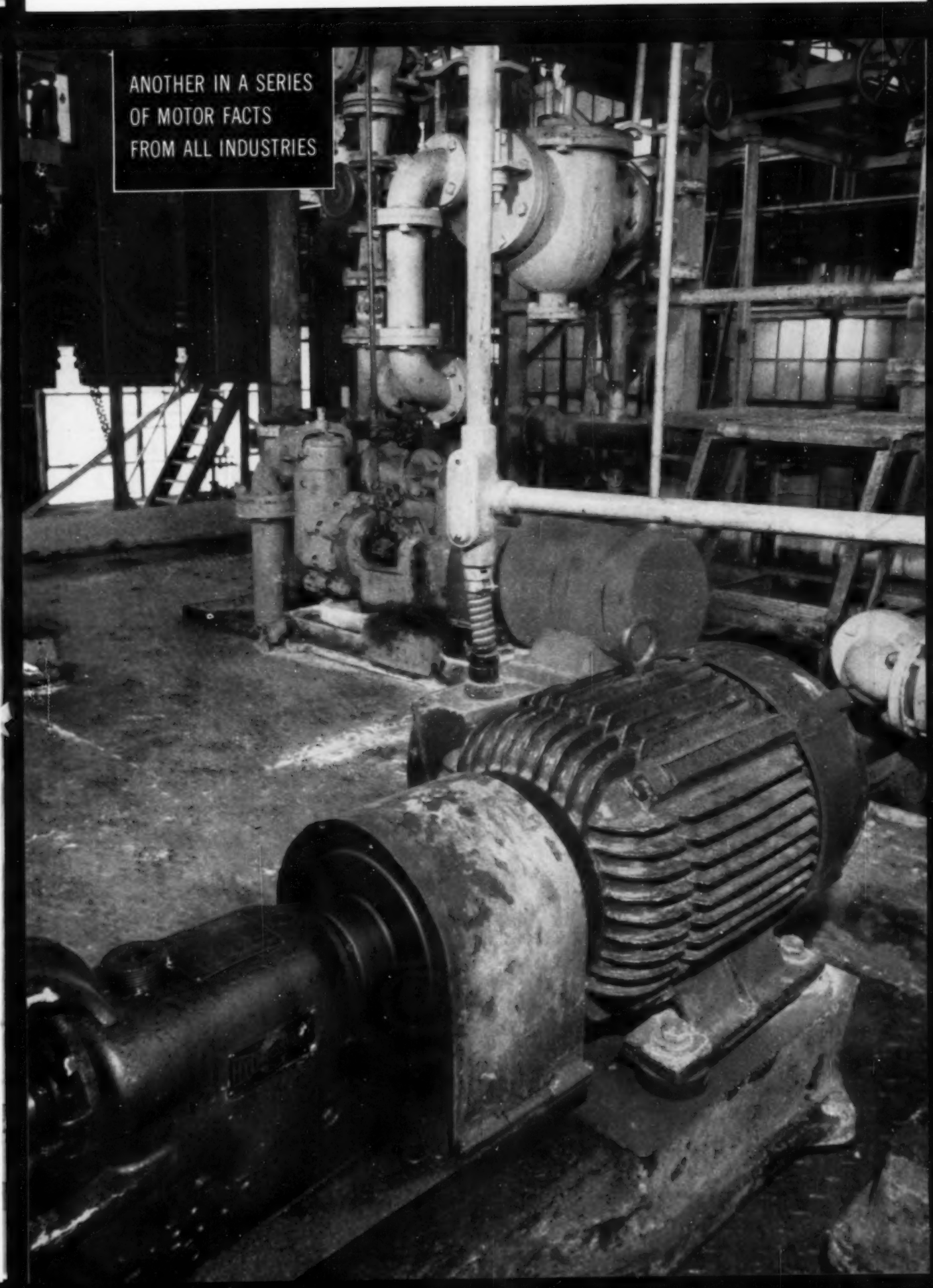
"In the four years we have used Life-Line® "A" motors, we have never stopped the process because of a faulty motor," reports Mr. John E. Harvey, Plant Engineer at Rumford Chemical Works.

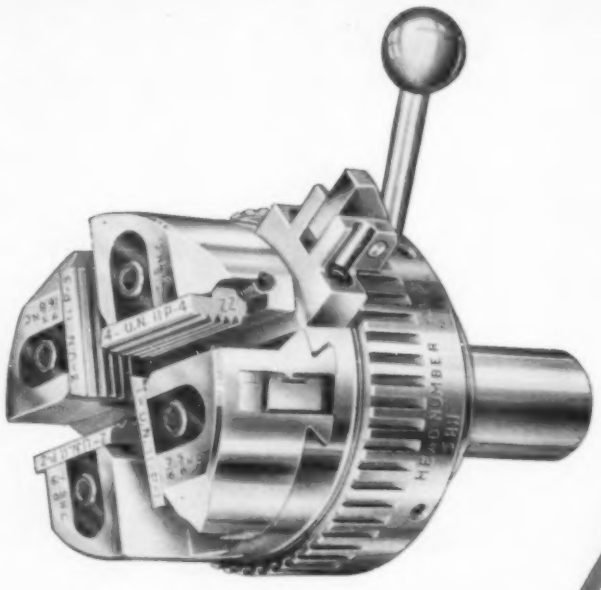
Before installing Life-Line "A" motors, the Rumford Chemical Works had to rewind, on an average, two motors a year at a cost of $100.00 per motor . . . always because the corrosive atmosphere put them out of operation. "We no longer have this problem," reports Mr. Harvey, "since the totally enclosed Life-Line "A" motors give us reliable, continuous operation without fear of damage from spilled acid which could come from leaks or breaks in the pipes."

POWER-UP with Life-Line "A" motors designed for modern industry's needs. For more facts, call your Westinghouse sales engineer or distributor. Or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22059-R

YOU CAN BE SURE...IF IT'S Westinghouse

ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

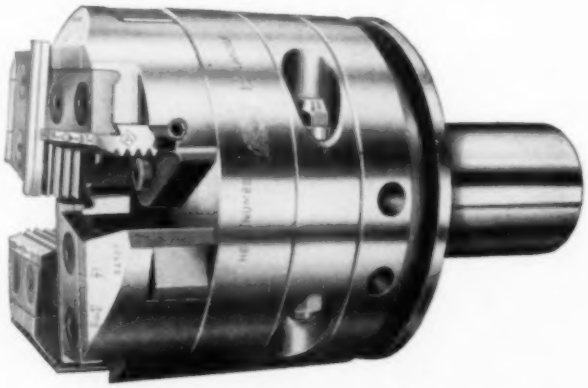




for Class 4 and 7 tolerances
HARDENED-AND-GROUND Die Heads

2

..... maximum



for Class 2 and 3 tolerances
HEAT-TREATED Die Heads

LANDIS *Machine* COMPANY
WAYNESBORO • PENNSYLVANIA • U.S.A.

448-C

styles of LANDIS Die Heads

PRECISION or ECONOMY

"Threading Efficiency" requires the selection of the proper die head for the job to be done, and is the essence of LANDIS design. To ensure that you may use the most efficient threading tool, LANDIS manufactures Die Heads in two basic styles:

HARDENED-AND-GROUND HEADS should be used where a high degree of thread-cutting accuracy is required. Their fundamental design and the inherent qualities of specially selected and hardened materials provide the maximum rigidity necessary for threading to Class 4 and Class 7 tolerances.

HEAT-TREATED HEADS are designed for the utmost economy when doing commercial threading, and will produce threads to Class 2 and 3 fits. The initial cost is small and rugged construction ensures trouble-free operation and few repairs. Wide range coverage requires minimum tool inventories, and along with the use of LANDIS Tangential Chasers allows maximum output per dollar of tool cost.

LANDIS Tangential Chasers are an important factor both in the economy and precision of these basic head styles. These chasers may be replaced or reground singly, will thread all diameters of the same pitch and form, and can be used for 80% of their original length. Their basic design minimizes stress and distortion, and allows either style of die head to produce threads of the accuracy for which it is recommended.

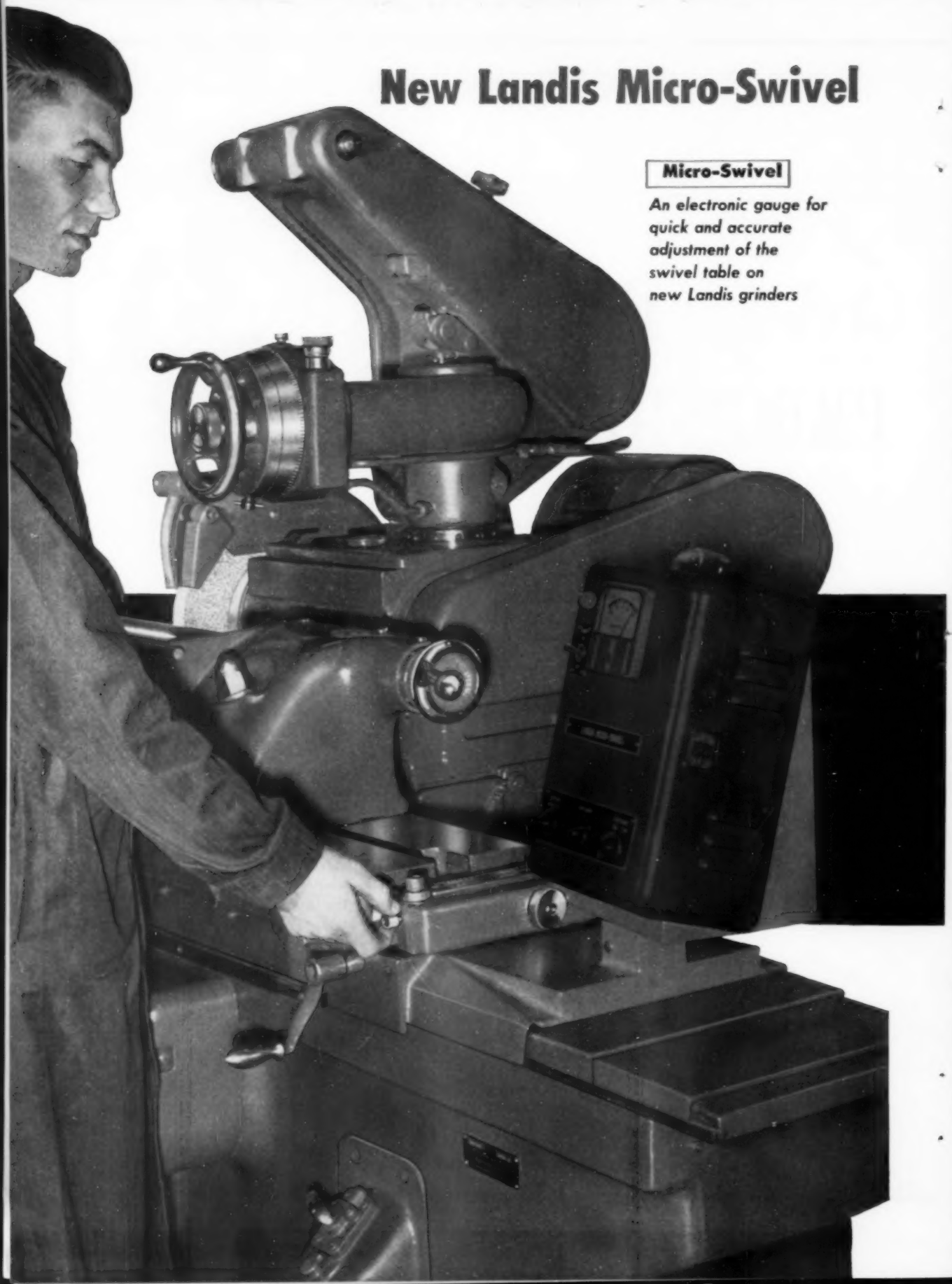
These THREADING TOOLS displayed at Booth 1538 ASTE Show

LANDIS manufactures more than 100 sizes and styles of standard and special Die Heads for use on threading machines, turret lathes, tapping machines and bar automatics. Let us suggest the Head most suitable for *your* needs—send specifications and ask for Bulletins F-80 and F-90.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT • CUTTING - TAPPING - GRINDING - ROLLING

448-C

New Landis Micro-Swivel



Micro-Swivel

An electronic gauge for quick and accurate adjustment of the swivel table on new Landis grinders

saves setup time on Landis grinders

gives these time saving benefits

Eliminates cut and try in setup
Gives precision alignment quickly
Reads in "tenths" or "thousandths"
Easy to use; even for unskilled operators

advanced features make Landis Micro-Swivel "best available"

One turn of knob sets detector regardless of table swivel position
Direct reading—no calculations necessary
No pushrods, chucks or set-latches to adjust
Rugged shop-type unit; cannot be jammed
Printed circuit—moisture proof
Separate readings for headstock and footstock ends of table

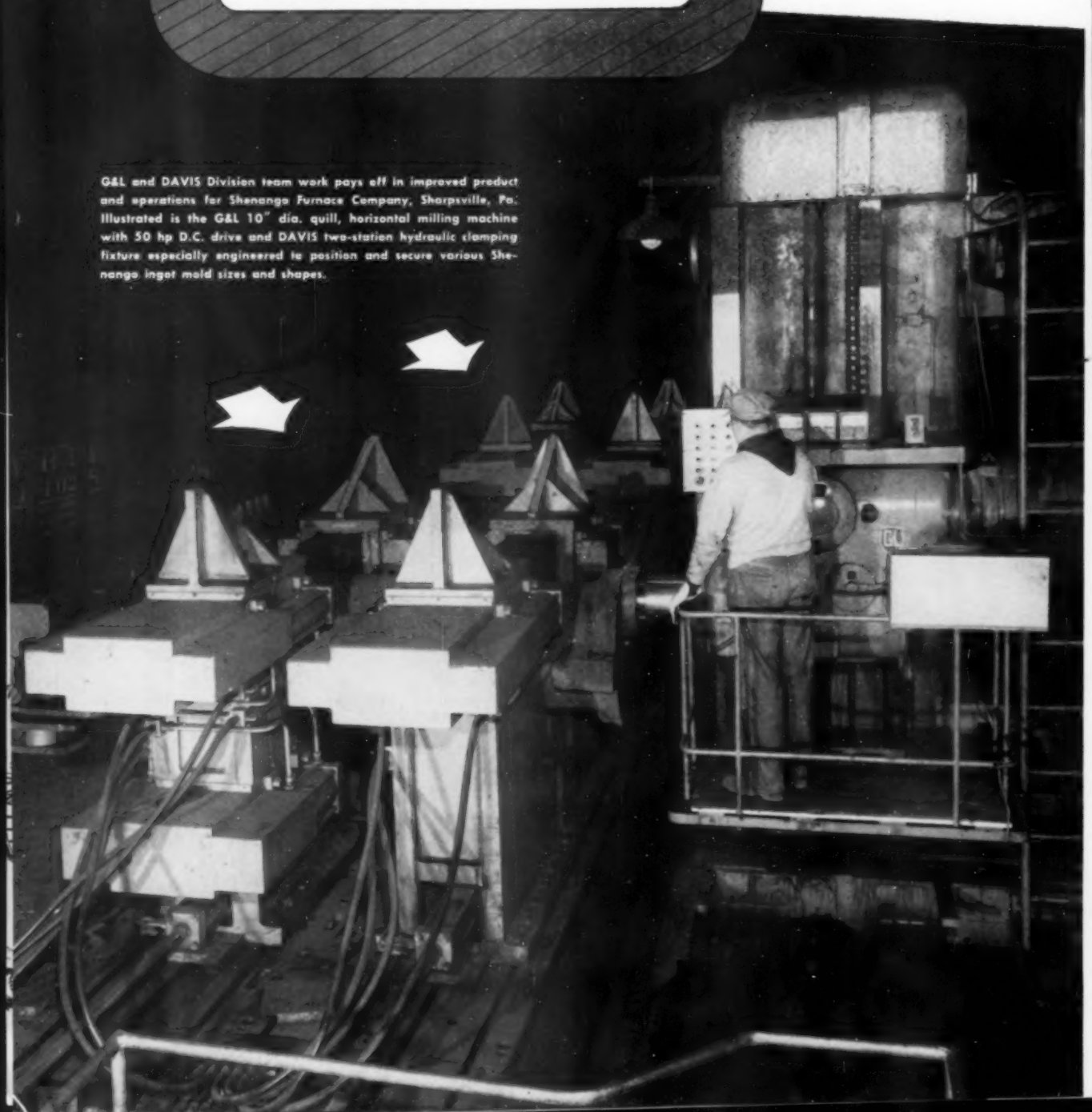
LANDIS

precision grinders

LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

Success story at the

Cuts machining time 85% on ingot molds over old method



G&L and DAVIS Division team work pays off in improved product and operations for Shenango Furnace Company, Sharpsville, Pa. Illustrated is the G&L 10" dia. quill, horizontal milling machine with 50 hp D.C. drive and DAVIS two-station hydraulic clamping fixture especially engineered to position and secure various Shenango ingot mold sizes and shapes.

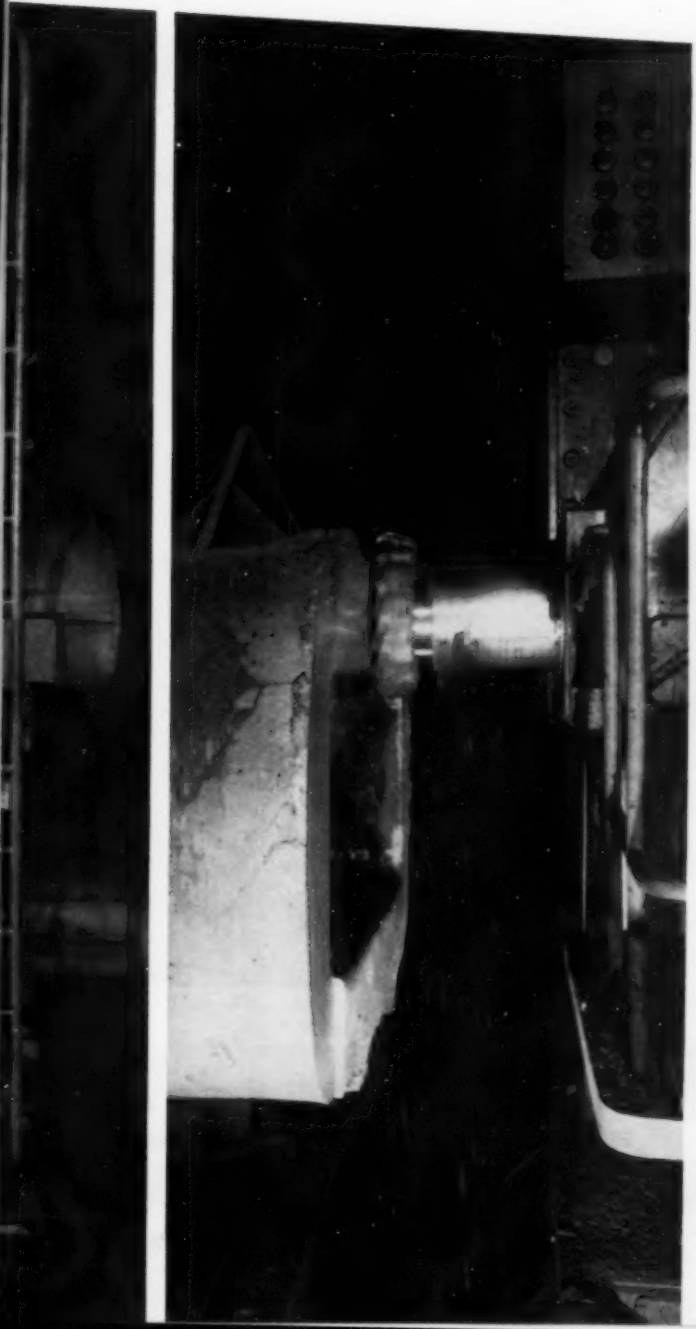
Shenango Furnace Company

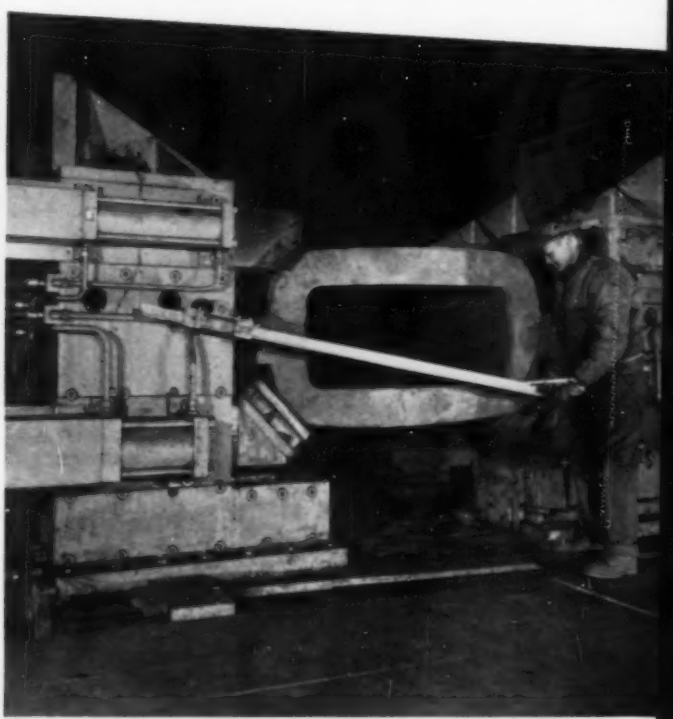
New G&L 50 hp Floor-Type Mill removes more than 150 cu. in. of cast iron per minute on all Shenango molds—time averages 1/8 of former time required!

Combined Giddings & Lewis and DAVIS Division machining and engineering talent . . . plus unique manufacturing skills . . . made this project an outstanding success.

For example, a mold with base dimensions of 43" x 91" now takes only 1½ hours machining — formerly required 8 hours!

You, too, can put the same type of creative design and production talent and application engineering to work on your problems. For consulting help and recommendations on all types of machining, or further details on this G&L floor-type mill, call your nearest Giddings & Lewis representative or write direct. State your problem — if possible, include work prints.





Two DAVIS matched sets of rugged hydraulic fixture clamps permit rapid loading, milling and unloading. While machining operations are performed, setup of another mold is made at adjacent station. Fixture features 10" square hydraulic rams with 12" wide serrated jaws exerting 1,200 psi clamping pressure.

Note G&L machine's metal hogging ability demonstrated on this plug bottom mold. Overall machine power and rigidity permit the carbide cutter to make heavy cuts through rough surfaces — bring mold ends to necessary flatness in record time.

G & L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-92

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double-Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.

G-92

Everything AUTOMATIC Except ...and that can be added later

In machine tools, too, it's a good idea to allow for future requirements. Cincinnati Grinding Specialists had this in mind when equipping the CINCINNATI FILMATIC 10"L Plain Grinder illustrated at the right with the latest quality and production control features. For today's requirements everything is automatic except work handling. Should conditions change at a later date, automatic work handling can be easily added. ¶ Highly desirable features incorporated in this machine for both today's and tomorrow's requirements include:

Automatic dual rate infeed cycle
Automatic air-electric gage sizing
Behind-the-wheel profile truing, with cycle counter
Automatic gap eliminator
Automatic headstock drive plate positioning

To take care of the future, when automatic work handling may be desired, a flat top table allows plenty of room for installation of equipment, and manually controlled footstock can be replaced with a hydraulically controlled unit. ¶ In addition to the foregoing aids to quality and production control, many fine standard features of low-cost performance are incorporated in this machine. Two are Cincinnati exclusives: FILMATIC grinding wheel spindle bearings and automatic grinding wheel balancing. These two alone put Cincinnati way ahead of the field, and a first-choice candidate to replace your productively obsolete machines. Get more information by writing for catalog No. G-661-1. Brief specs in Sweet's Machine Tool File.

Flat top table allows for future automation. Production data, manual loading.

Part name	Shaft end
Material	Steel
Operation	Grind three diameters
Stock removal	.012"
Production	125 per hour @ 80% efficiency

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

Work Handling

Automatic quality and production control features, incorporated in this CINCINNATI FILMATIC 10"L Plain Hydraulic Grinder, help the operator produce high-quality work at the rate of 125 parts per hour.

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Easy to set up...
Easy to operate...

This Norton 8″ Surface Grinder

Here's a rugged machine that sets up quickly for production runs and maintains steady accuracy on small parts. And it's just as efficient for grinding a variety of small units in tool room work.

Designed with both hand and hydraulic table traverse and cross feed, the Norton 8″ x 24″ hydraulic surface grinder produces plane surfaces smoothly and speedily. Convenient controls and easy accessibility keep operating and maintenance time low — while the quick, easy set-ups cut your unit costs on job after job.

Write for Catalog 190 on this popular, money-saving Norton surface grinder, or for literature on its 6″ and 10″ companion models. And remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

District Sales Offices: Worcester • Hartford
New York • Cleveland • Chicago • Detroit

The wheel head tilts!

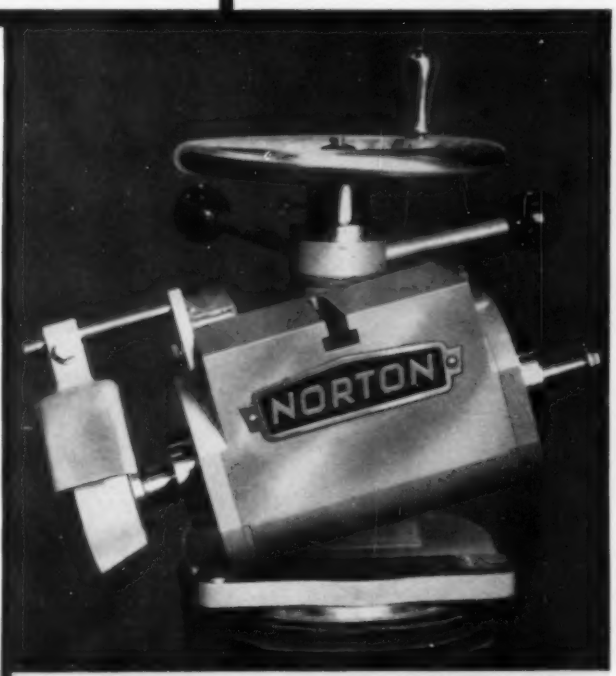
No other cutter and tool grinder does so many jobs and . . .

saves so much money

On the Norton No. 20 cutter and tool grinder the wheel head can be tilted up to 15° above or below horizontal, and swiveled through 360° — simplifying such difficult jobs as grinding taper reamers, step counterbores, form tools and milling cutters.

As a result of this and other pace-setting advantages, the No. 20 brings new speed and economy to the widest range of tool and cutter grinding jobs, adding the profit-boosting "Touch of Gold" to your grinding operations.

See your Norton Representative for further facts on the No. 20. Ask him for Catalog 189. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.



To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Offices:
Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON PRODUCTS: Abrasives • Grinding Wheels
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BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cat Tapes

NOW MORE THAN EVER

MARVEL HIGH SPEED EDGE HACK SAW BLADES

should be **YOUR FIRST CHOICE**

This is no time for "second-best" performance from your hack sawing machines. Today, every cut you make on a hack saw should be done as quickly, accurately, and economically as possible.

The *blades* you use can often mean the difference between mediocre work and top performance from your hack sawing machines. Here are 3 big advantages unbreakable MARVEL High-Speed-Edge Hack Saw Blades can bring to your cutting-off operations:

1 HIGHER PRODUCTION . . .

MARVEL High-Speed-Edge Blades are shatterproof and can be worked harder and faster than any other blade. They will withstand the highest speeds and heaviest feeds attainable on any hack sawing machine with complete safety. Machine operators working with MARVEL Blades naturally apply greater tensions, feeds, and speeds because they know they are safe from personal injury accidents. The result is faster cutting-off.

2 GREATER ACCURACY . . .

MARVEL Blades can be safely tensioned from 200% to 300% more taut than ordinary blades. Higher blade tensions produce greater rigidity of the high-speed-steel cutting edge, resulting in maximum attainable accuracy of cut-off blanks.

3 LONGER BLADE LIFE . . .

Each MARVEL High-Speed-Edge Hack Saw Blade is triple tempered to assure maximum toughness of the cutting edge. MARVEL Blades not only give you longer life, they assure a more efficient cutting life and lower blade costs.

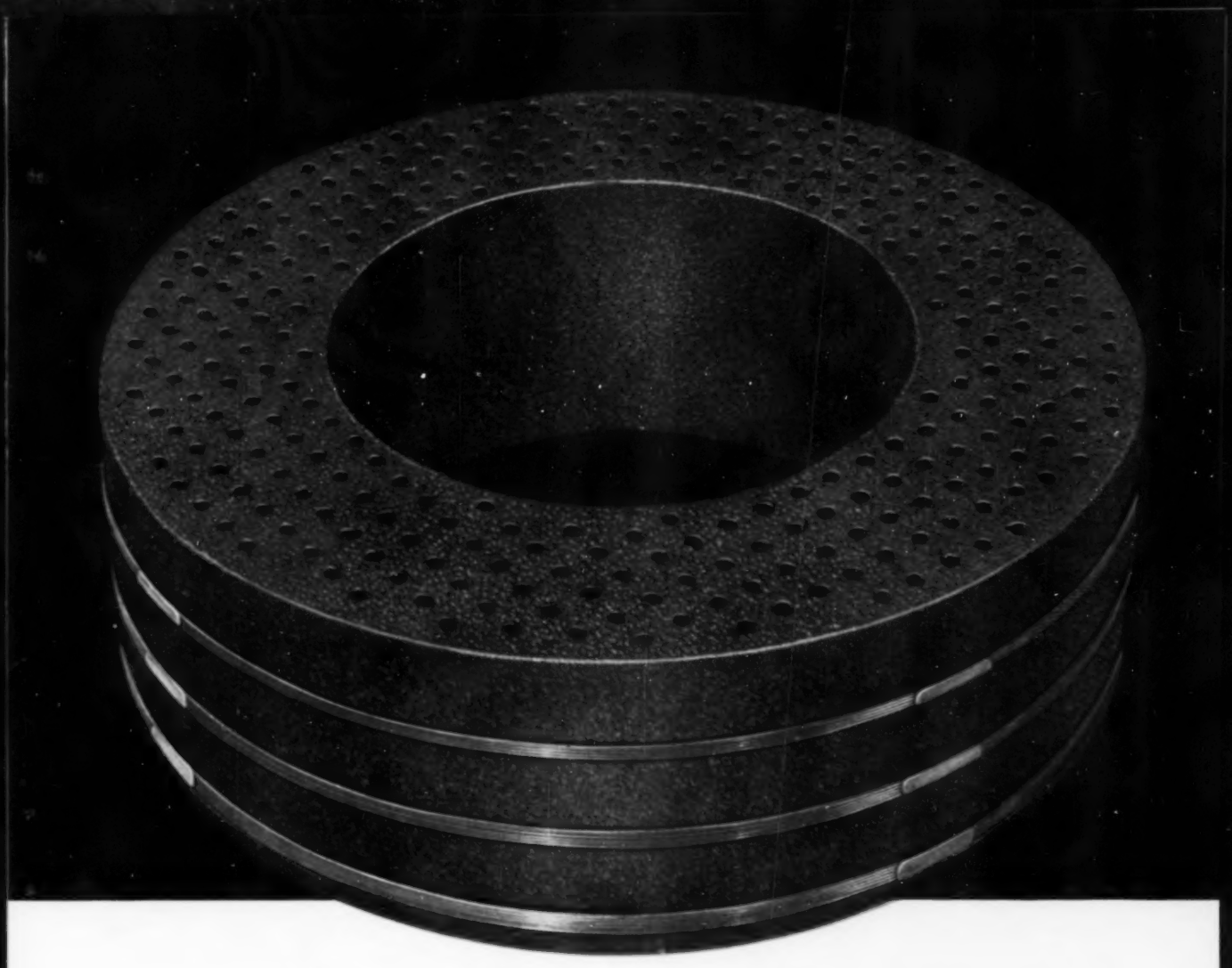
Why gamble? Demand MARVEL Blades by name, and be sure you're getting the best blades on the market. Leading Industrial Distributors have them in stock.

B-1123

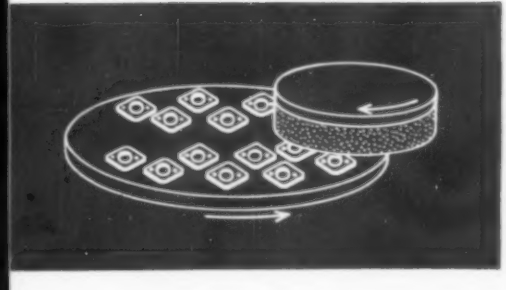
Write for the new MARVEL Cutting Tool Bulletin and the name of your nearest MARVEL Distributor.

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. • CHICAGO 39, ILLINOIS

MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades



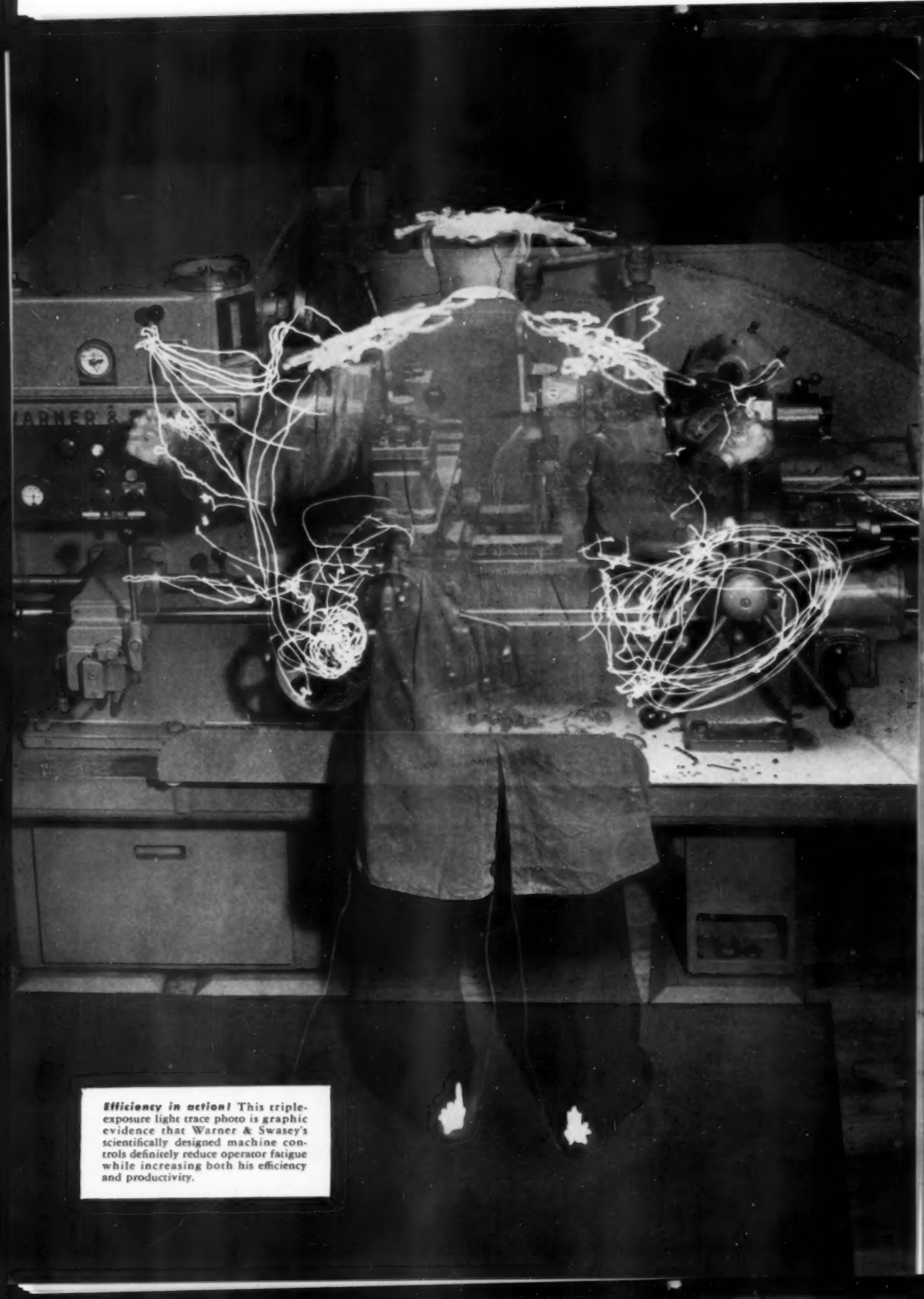
7500 more parts per disc after changing to Gardner



Workpiece .....Steel exhaust flange
Production .....47,500 parts per disc
Former Disc .....40,000 parts per disc

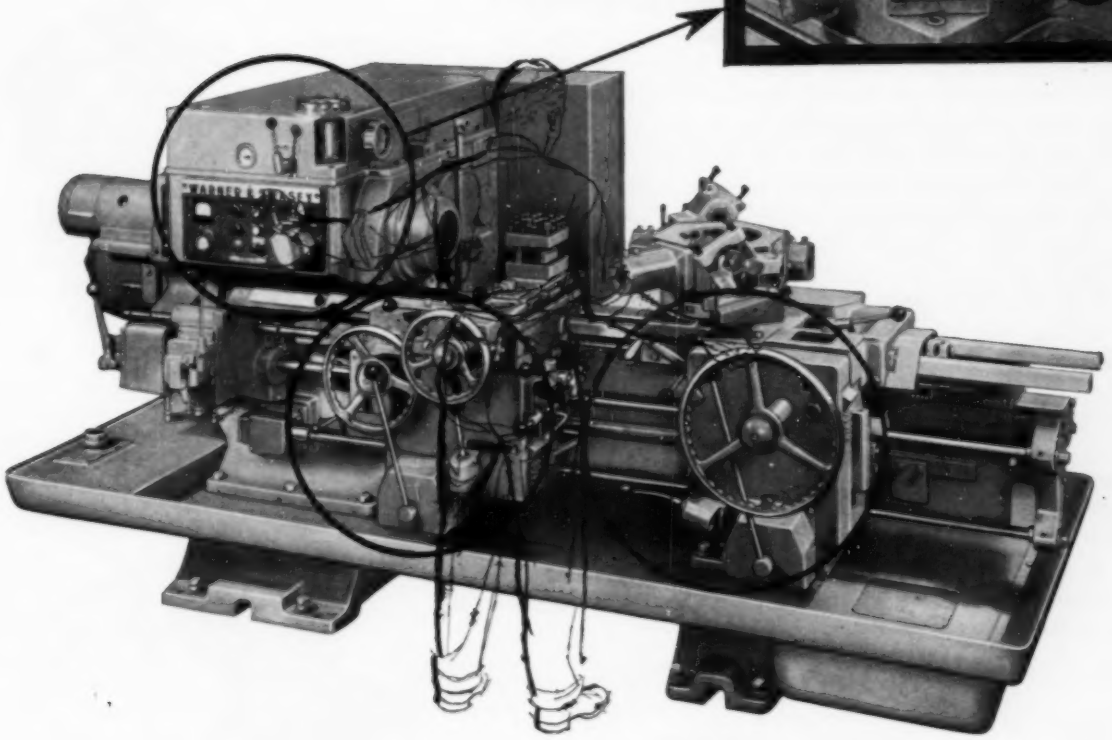
Call the Gardner Abrasives Man to demonstrate disc grinding efficiency the Gardner way.

GARDNER
abrasive discs
BELOIT, WISCONSIN



Efficiency in action! This triple-exposure light trace photo is graphic evidence that Warner & Swasey's scientifically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.



Warner & Swasey Zoned Controls boost production by increasing operator efficiency

Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Norton Pulpstones Prove...REPUBLIC COLD DRAWN BARS SHRUG OFF BRUTAL PUNISHMENT

Chewing ton after ton of whole logs into pulp is all in a day's work for pulpstones manufactured by the Norton Company, Worcester, Massachusetts. Maximum reliability is a must in every component.

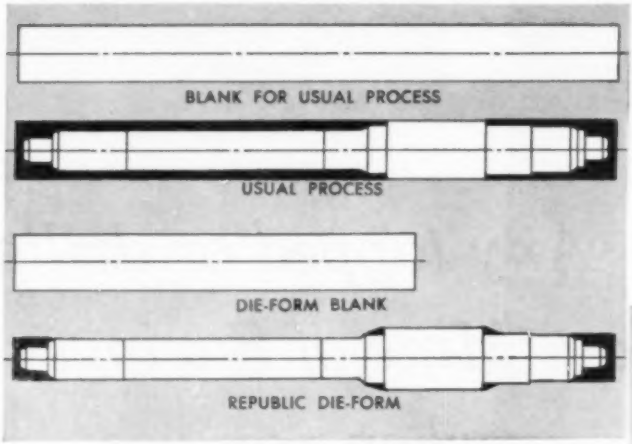
This is a major reason why Norton specifies Republic Cold Drawn Steel Bars for production of anchor studs to hold abrasive segments to concrete cylinder. Since cold drawn bars show marked physical improvement compared with the same analysis, hot rolled, they provide extra strength to absorb brutal in-service stress.

Beyond final product reliability, Republic Cold Drawn Steel Bars facilitate the severe forming combination of machining and roll-threading required in stud production. Finally, finished stud cost is far below the minimum made possible with former materials.

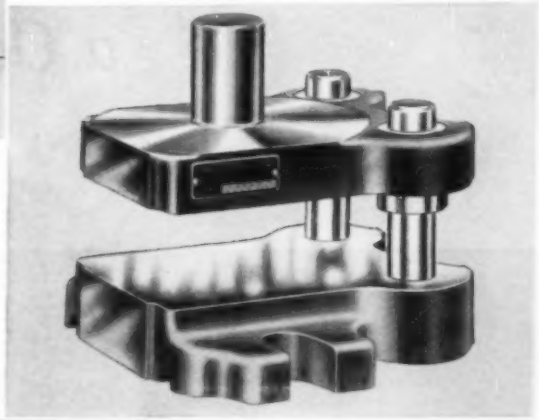
In addition to greater strength, hardness, and machinability which benefit the Norton Company, Republic Cold Finished Steel Bars provide both size and cross-sectional accuracy, smooth bright surface, absence of scale, and close tolerance straightness.

It will pay you to check these characteristics against your product and production requirements. For further information, contact your local Republic representative or mail coupon.

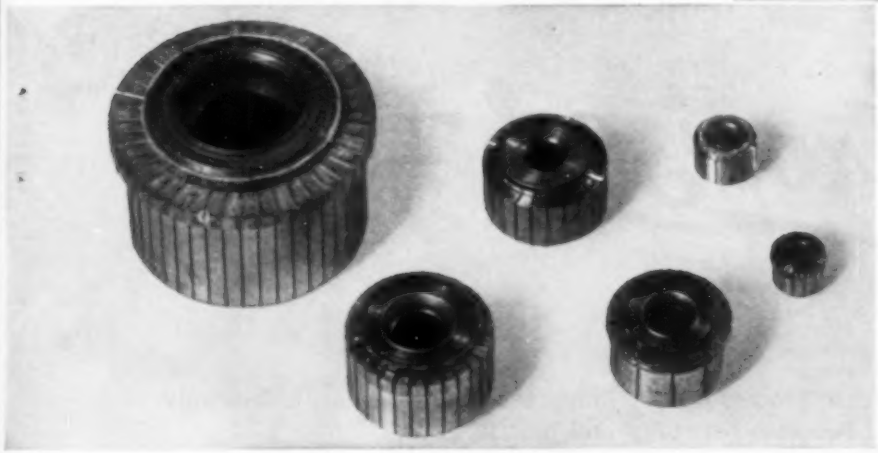
PULPSTONE STUDS require a rugged combination of roll-threading and machining during production. Finished stud is subject to brutal punishment as pulpstone reduces logs to wood pulp. Republic Cold Drawn Steel Bars meet all demands with flying colors.



INCREASED DEMANDS ON MANUFACTURING EFFICIENCY to meet shrinking profit margins require use of modern methods and materials. Republic Die Form is a good example of such progress. Die Form is a cold formed steel bar closely approximating the final multi-diameter part. Using a Die Form blank, you can make major savings in required machining and scrap loss. In the example shown above, 200 tons of Die Form blanks were used to produce parts formerly requiring 300 tons of conventional bar stock. Mail coupon for facts.



METAL STAMPING PRODUCTION DEMANDS require both strength and accurate machining in die sets manufactured by the Union Manufacturing Company, New Britain, Connecticut. As a result, Union has standardized on Chateaugay, Republic's exclusive low phosphorus, copper-free pig iron for maximum strength, flaw-free, easy-to-machine castings. Other superior characteristics of Chateaugay include its exceptional fluidity, even cooling, and fine dense grain structure. For complete information, clip and mail coupon.



CLOSE TOLERANCE DEMANDS require that center holes in these electric motor commutators be virtually perfect to assure a proper press-fit on motor armatures. When ordinary steel was used for hubs, expensive pull broaches used to finish holes lasted for only 25,000 pieces. Several years ago, Han-Kor, Inc., Cleveland, Ohio, switched to Republic Cold Drawn Leaded Alloy Steel for hub manufacture. Since that time, no broaches have required replacement. Top machinability of Republic Cold Drawn Leaded Steels may help you save time and money. Send coupon for data.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AM-5226
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send me more information on:

☐ Cold Finished Steel Bars ☐ Chateaugay Pig Iron
☐ Cold Finished Leaded Steel Bars ☐ Die Form

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

Any tapped or drilled
a Gold Mine of $avings
. . . when you use

MORSE

Electrolized Tools

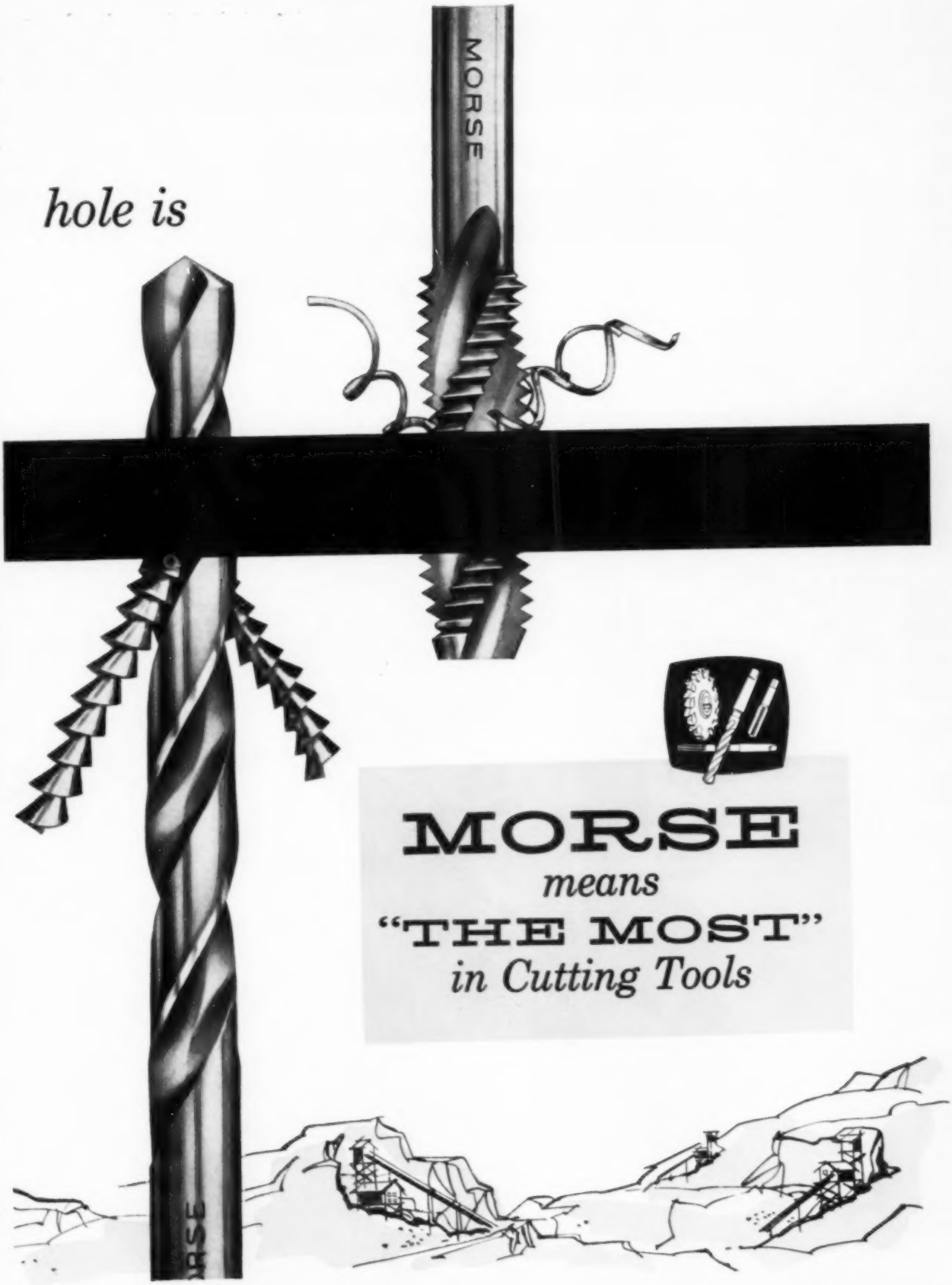
This exclusive Morse process *penetrates the metal*, and becomes part of its atom-structure . . . puts extra durability under skin of the cutting tool.

That's why so many cost-conscious buyers specify Morse *Electrolized* Tools . . . because they know it's the only way to get as much as 100% longer tool life, with every hole cleanly and precisely cut.

Proof? All you have to do is ask your Morse-Franchised Distributor.

MORSE TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS.
A Division of VAN NORMAN INDUSTRIES, INC.
Warehouses in
New York, Chicago, Detroit, Dallas, San Francisco

hole is



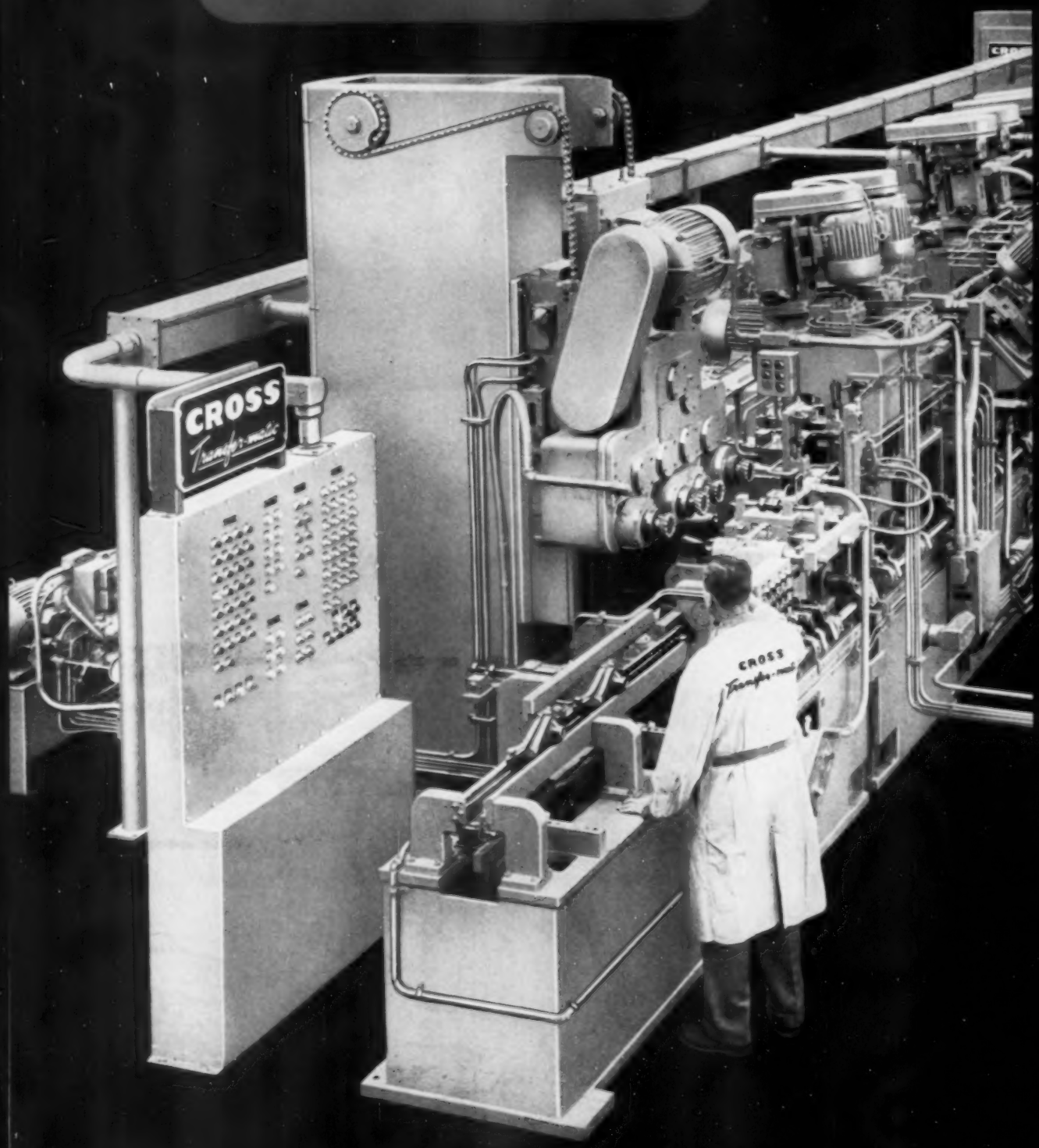
MORSE

means

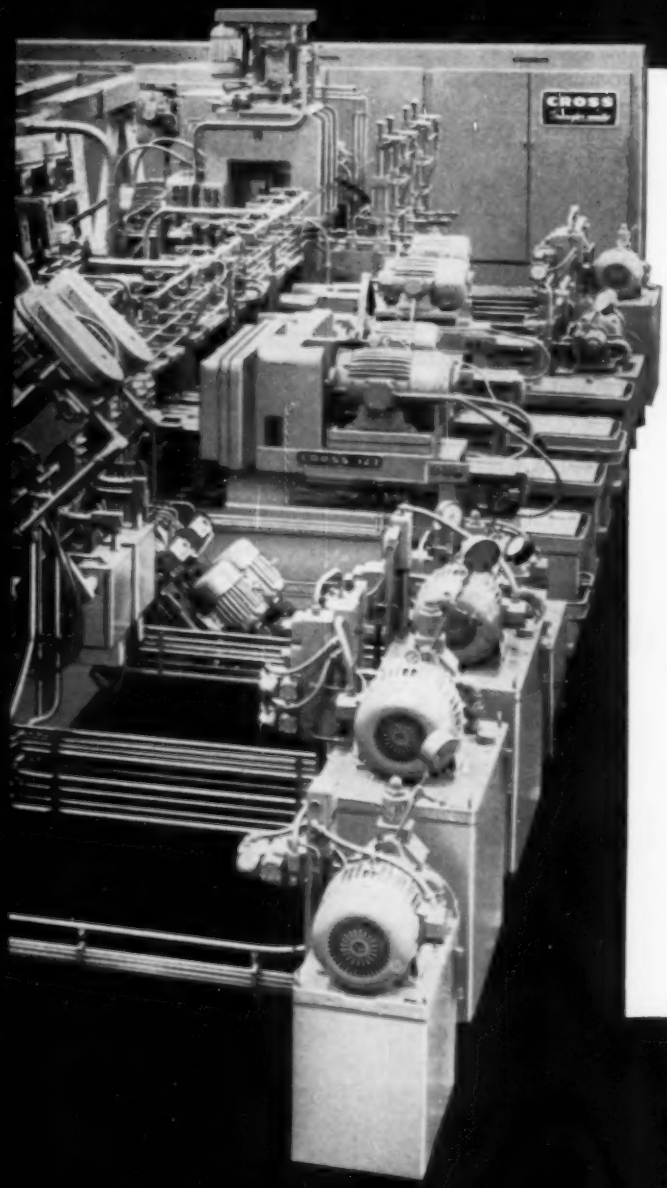
"THE MOST"

in Cutting Tools

Complete Machining of Water Pump Bodies



Another Transfer-matic by Cross



- ★ Machines two castings simultaneously at rated capacity of 200 pieces per hour.
- ★ Station 1 load; Station 2 mills mounting faces; Station 3 drills thermostat by-pass hole, mainshaft hole and four mounting holes; Station 4 cross-faces cover face and drills one angular vent hole; Station 5 chamfers thermostat by-pass hole, drills six cover holes, spot-faces mainshaft hole on inside; Station 6 cross-faces impeller face, reams thermostat by-pass hole and drills second angular vent hole; Station 7 spotfaces and chamfers mainshaft hole, spotfaces four mounting holes and drills by-pass hole on inside; Station 8 finish cross-faces impeller face and recesses center of mainshaft hole; Station 9 semi-finish bores mainshaft hole; Station 10 finish precision bores mainshaft hole; Station 11 tap drills heater connection hole and probes cover holes; Station 12 taps heater connection hole and six cover holes; Station 13 automatically unloads two pump bodies.
- ★ Locating: in Station 2, parts are located from foundry pads; in Station 3, from milled faces and cored water passages; and, from Station 4 on, from milled faces and two mounting holes.
- ★ Cross' "building block" principle provides flexibility for future part design changes.
- ★ Other features include: complete interchangeability of all standard and special parts for easy maintenance, construction to JIC Standards, hardened and ground ways and automatic lubrication.

Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

for management

The experienced investor examines his portfolio of securities frequently, buying or selling to adjust to changing conditions and improve his earnings.

The metalworking executive is an investor, too, responsible for constantly checking his investment in machine tools. He knows that shrinking returns on outmoded equipment can squeeze him right out of competition.

If you are currently surveying your "portfolio" of machine tools, it will pay you to consider an investment in Avey production equipment, which in many cases has earned its acquisition price in less than two years. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio

Standard machine price equals

for production men

The flexibility of "standard" equipment and the production of "special" are combined in this 62-foot Avey Line-O-Dex machine.

Operations on the jet engine diffuser case include drilling, countersinking, reaming, and lead screw tapping.

One fixture moves both linearly and radially to index the part. Add a second fixture and you double production.

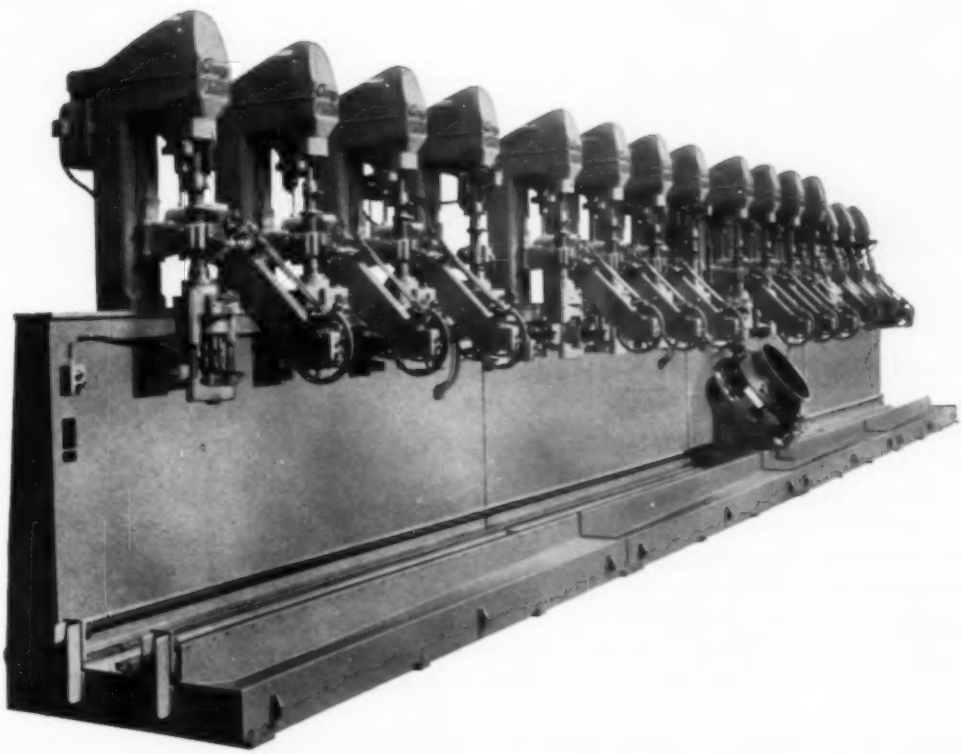
Standard drilling columns are arranged with multiple spindle drill heads which have power feed, four rates of feed, adjustable speeds, and additional head and quill travel to permit easy changeover to a new design.

Transfer mechanism is supported by the base. Another example of Avey's customer-oriented engineering.

Avey

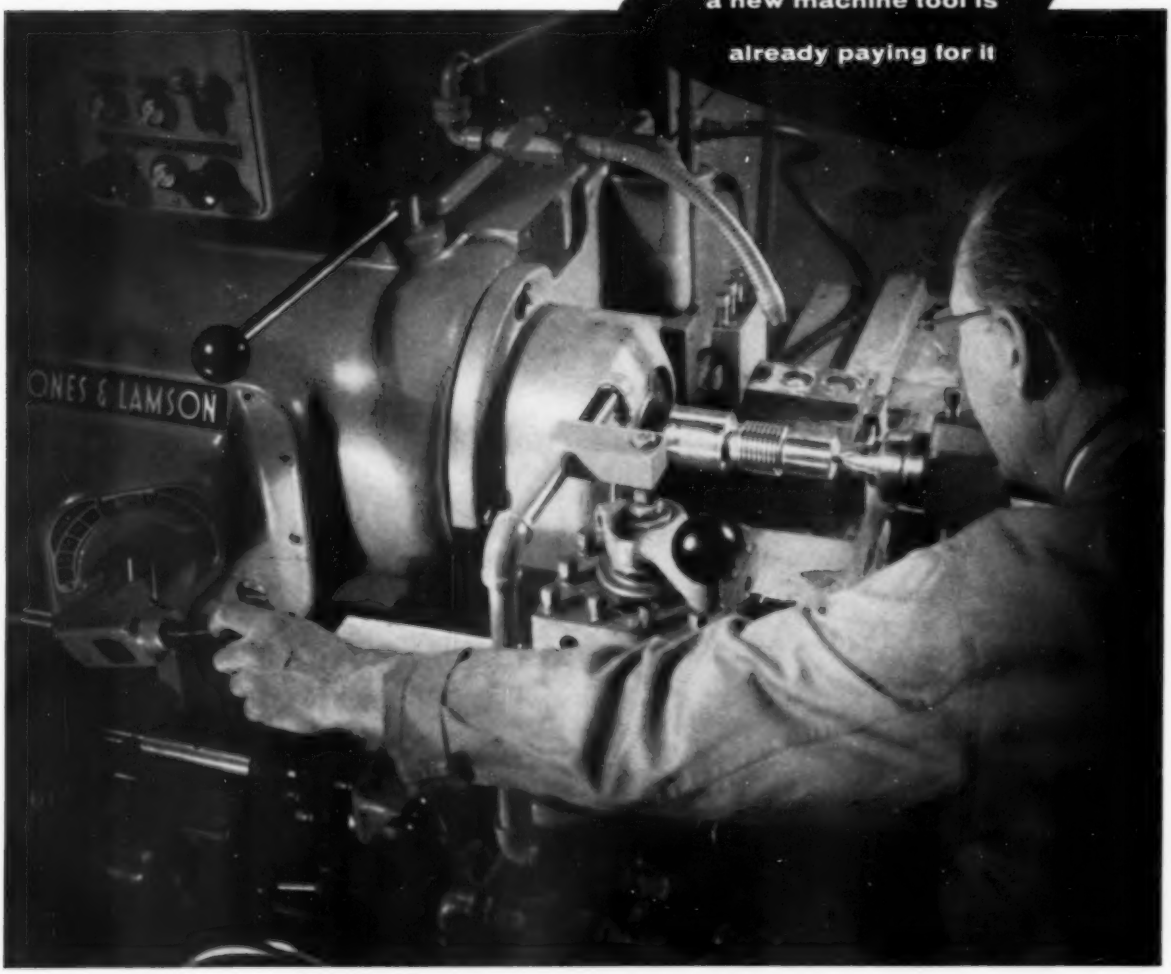
drilling, tapping, production machines

special machine profit



JONES & LAMSON MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it



The Turret Lathe with a fully automatic thread-chasing cycle!

Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader!

This Auto-Threader will chase straight or taper threads — or a combination — internal or external, from the front of the machine.

Other features include: uniform thread length, by means of positive stop and follower nut disengagement together with rapid tool withdrawal; precision lead control by full depth follower nut engagement on a hardened and ground leader.

Write for descriptive folder No. 5440. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

?

Are you really putting your small radial drills to work...OR... are they just drilling machines

If they are "AMERICAN" Hole Wizards they are DRILLING...TAPPING and BORING MACHINES

...not just radial drills!

To further improve their boring qualities the new "AMERICAN" 9 inch and 11 inch column Hole Wizards now may be equipped with a FINE FEED BORING ATTACHMENT.

This attachment, furnished in addition to the standard feeding mechanism, merely by the flip of a lever reduces the standard feed range 75 per cent.

The fine boring feeds thus provided are the answer to precision boring on radial drills. Many tool and die shops are already using them for high precision, fine finish boring of jigs and fixtures.

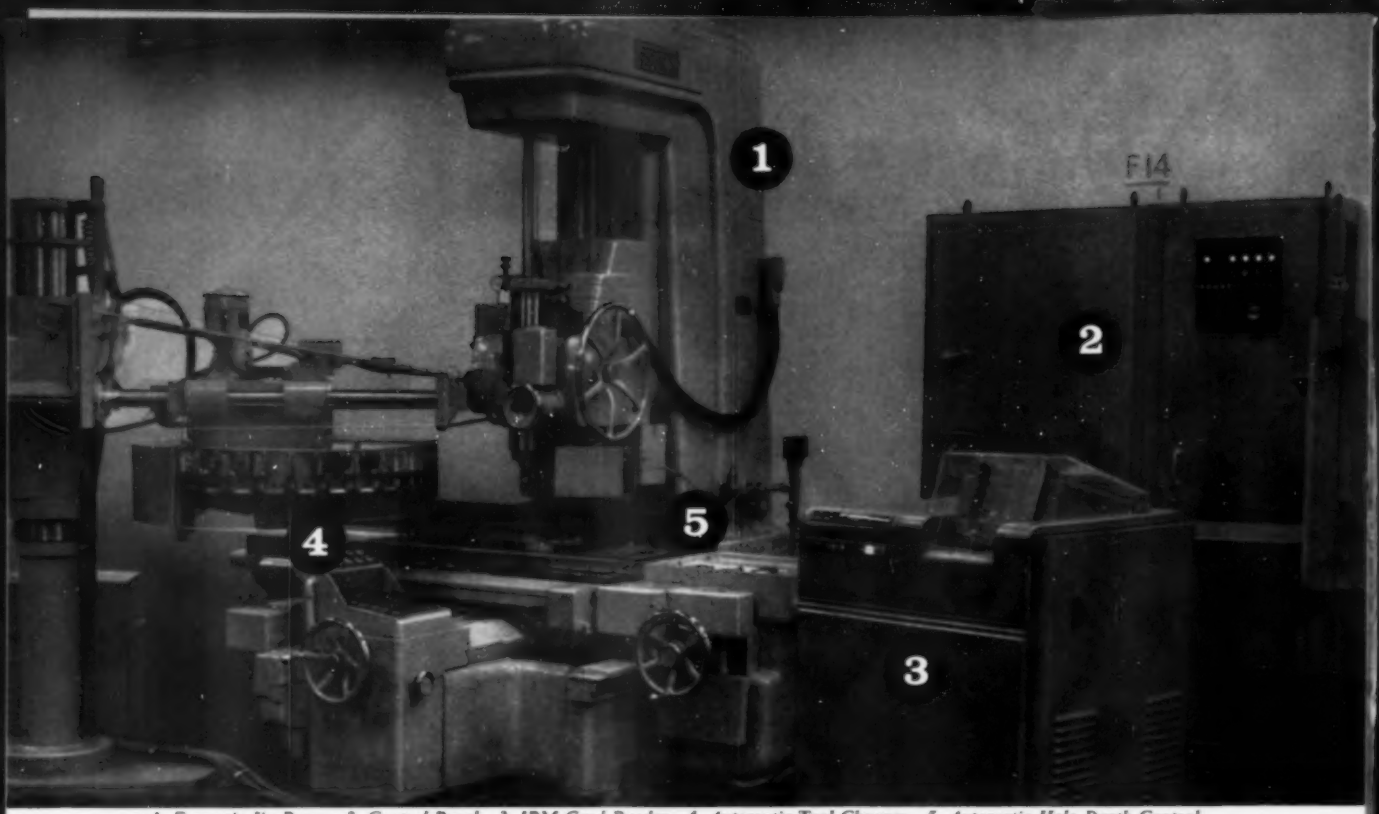
And don't overlook the advantages of the Hole Wizard's Helical Gear—Lo-Hung Spindle Drive —NITRIDED SPINDLE AND SLEEVE—TIMKEN MOUNTED WITH OUTSIDE ADJUSTMENT FOR SPINDLE BEARINGS.

These exclusive "AMERICAN" features permit putting your radial drills to work at a profit.

- ***Ask for bulletin No. 325 and get all the facts.***

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



1. Fosmatic Jig Borer 2. Control Panel 3. IBM Card Reader 4. Automatic Tool Changer 5. Automatic Hole Depth Control

World's first totally automatic jig borer--by Fosdick

Now, any jig boring operation can be completely programmed and controlled by punched cards and tapes. This total automation is available only on the Fosmatic Jig Borer, developed by Fosdick and the International Business Machines Corp.

HERE'S HOW IT WORKS: Once workpiece is loaded on the jig borer, the following functions are controlled completely automatically —

Table and saddle locations
Spindle feeds and speeds
Feed depth
Spindle head height
Automatic tool changing

Dimensions, feeds, speeds, etc. are charted by your Production Engineering Department, then tape or cards are punched (a simple clerical procedure). Optimum programming can be achieved by using an automatic computer to establish the best possible sequence of operations. Hole size and location are accurate to ±.0001″, hole depth within .002″.

SELECT THE DEGREE OF BORING AUTOMATION YOU NEED. The above numerically controlled functions are available individually or as a group. By controlling table and saddle location only, your engineers can establish optimum work sequence (eliminates leaving decisions to the operator). By adding the other numerically controlled functions, you further eliminate errors and lost time. On single piece jobs, as well as precision production runs the result is lower cost per piece, considerable savings in set-up time and inventory, greater flexibility in scheduling. Often, jigs and fixtures are eliminated, with their high cost and lead time.

A meeting with your Fosdick representative will help you quickly determine just how these dramatic new methods can best serve your production needs. Write for Bulletin NC-A.

Need boring equipment? Get a proposal from Fosdick!

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Specifications and Major Features of 1⅜" and 1⅝" Model AB CLEVELAND DIALMATICS

	1⅜" Model AB	1⅝" Model AB
Max. Round Bar	1⅜"	1⅝"
Max. Hex. Bar	1 31/64"	1 13/32"
Max. Square Bar	31/32"	1⅛"
Horsepower	7½	7½
Idle Motion Time	6.3 secs.	6.3 secs.
Stock Feed Stroke	9"	9"
Turning Length	4⅞"	4⅞"
Dia. Tool Circle	9"	9"
No. Turret Holes	5	5
Cross Slide Travel	4"	4"
Cross Slide Tooling Width	6 1/16"	6 1/16"

Infinitely variable spindle speeds.
Spindle speed range—40 to 3200 R.P.M.
Cleveland exclusive quick change collet.
Quick change feedshell pads which require no screws.
Variable tool feeds through electric feed drive.
High speed Geneva turret index.
Flame hardened double cross slides.
Quick hand crank stock feed adjustment.
Universal camming and easily adjustable cam drums.

Write for new 1⅜" and 1⅝" Model AB Bulletin

gives you maximum productivity with new 1⅜" and 1⅝" Model AB

CLEVELAND DIALMATICS

Cleveland brings to metalworking another major advancement in single spindle bar automatic machine design! Now, by making *dial settings* on the control panel, you preselect the *exact* forward and reverse tool feed——and the *exact* forward and reverse spindle speed—for each of five working turret tools. Each tool is completely and individually controlled throughout the cycle . . . *tuned* for maximum cutting efficiency!

There are *no change gears*. Spindle speeds are electronically controlled and infinitely variable between 40 and 3200 r.p.m. You can preselect and set 10 different spindle speeds for each machine cycle. Spindle speed changes and reversals are entirely automatic and are made through electric clutches, which make the number of changes or reversals per minute practically unlimited.

A few of many modern features of these new Clevelands are listed at left. It will pay you to get full information. Get in touch with a Cleveland sales engineer. He'll give you the full story on the many economies these new Clevelands can bring to your plant.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

XLD EX-CELL-O FOR PRECISION

CHIP-BREAKER ASSEMBLY: On the opposite end, mounted under the reciprocating chip-breaker wheel is the chip-breaker table with vertical adjustments. It accommodates adjustable tool block fixture which holds tool in place while grinding chip-breaker groove at desired angle.

TWO MODELS AVAILABLE: Style 142 for conventional grinding with vitrified or diamond wheels; Style 264, equipped with metal-bonded diamond wheels, for *electrolytic* grinding.

new DUAL PURPOSE RECIPROCATING TOOL GRINDER

Ex-Cell-O takes all the work out of both conventional and chip-breaker tool grinding

Now an entirely new reciprocating double end tool grinder designed by Ex-Cell-O to do two jobs in one—conventional grinding on one end, chip-breaker grinding on the other—has now been added to Ex-Cell-O's line of conventional, double end, carbide and Method X tool grinders. The difference is the adjustable, power-controlled reciprocation of grinding wheels. The operator need only hold the tool at the pre-set angle.

Other features of this new grinder include: variable stroke (0 to 1½"); variable number of reciprocations (0 to 220 strokes per min.); in-built motorized precision grinding spindle, saddle-mounted to reciprocate along hardened and ground bars which are mounted on pre-loaded ball bushings. You'll want to see for yourself the capabilities of this new Ex-Cell-O—to do so, simply contact your local Ex-Cell-O Representative. Or, if you wish, write direct to Ex-Cell-O, Detroit. Ask for Bulletin 461872.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-25

You wouldn't cut out paper dolls with a hedge clipper!!

Then why shear 6-inch wide material with a 10-foot shear?

Cutting a small piece of light metal, plastic or rubber on a big shear is even more expensive than it is exasperating. Yet many shops, out of necessity, tie up big shears with small work.

That problem is solved by the New Lodge & Shipley 24" Speed Shear. Specially designed for fast cutting of small pieces, it has a capacity of 1/8" x 24" mild steel. Its unique work table is provided with holes which allow fast set-up of guides, templates and protractors for production of straight-side blanks at speeds up to 120 strokes per minute.

A 24" Speed Shear may easily pay for itself merely in freeing a big shear from wasteful small jobs. Investigate its possibilities in your plant. For detailed Bulletin No. PS-12, write: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio**

Lodge & Shipley

New Positive Rake
ARMSTRONG
Carbide Insert TOOL HOLDERS

See us at
our BOOTH No. 308
ASTE SHOW

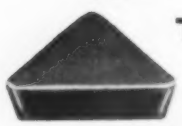
with proven ARMSTRONG Design Features

Rapid Indexing—always easily accessible from top or bottom sides . . . reduces down time.

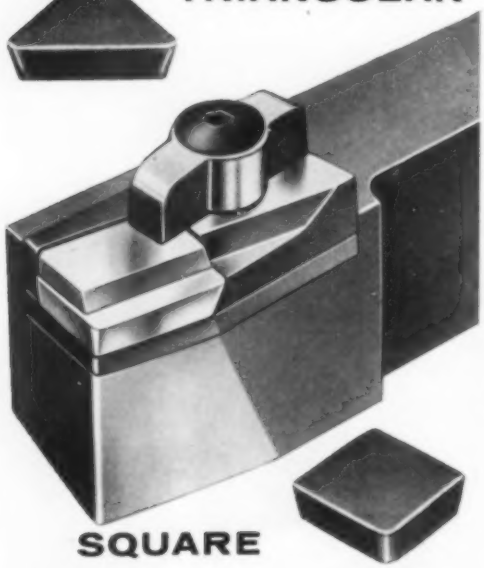
Replaceable Seat of Hardened Tool Steel—prevents damage to shank.

Huskier shanks of Heat Treated Alloy Steel—for added strength and rigidity.

Shank Styles for Use in both Conventional and Open Side Tool Posts.



TRIANGULAR

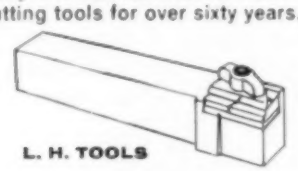


SQUARE

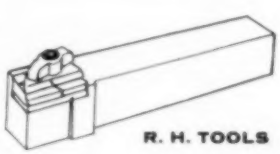
These positive rake Carbide Insert Tool Holders are for every day tool room and production turning on engine lathes, turret lathes and screw machines. They permit increased cutting speeds associated with the use of carbides and they entirely eliminate carbide tool grinding.

Low cost positive rake ARMIDE "throw away" Inserts provide three or four cutting edges per insert. Triangular inserts have three, square inserts four cutting edges. They are available in three grades of ARMIDE: 350, 370 or 883.

Buy positive and negative rake Carbide Insert Tool Holders which carry the ARMSTRONG trade mark; leader in tool holders and cutting tools for over sixty years.



L. H. TOOLS



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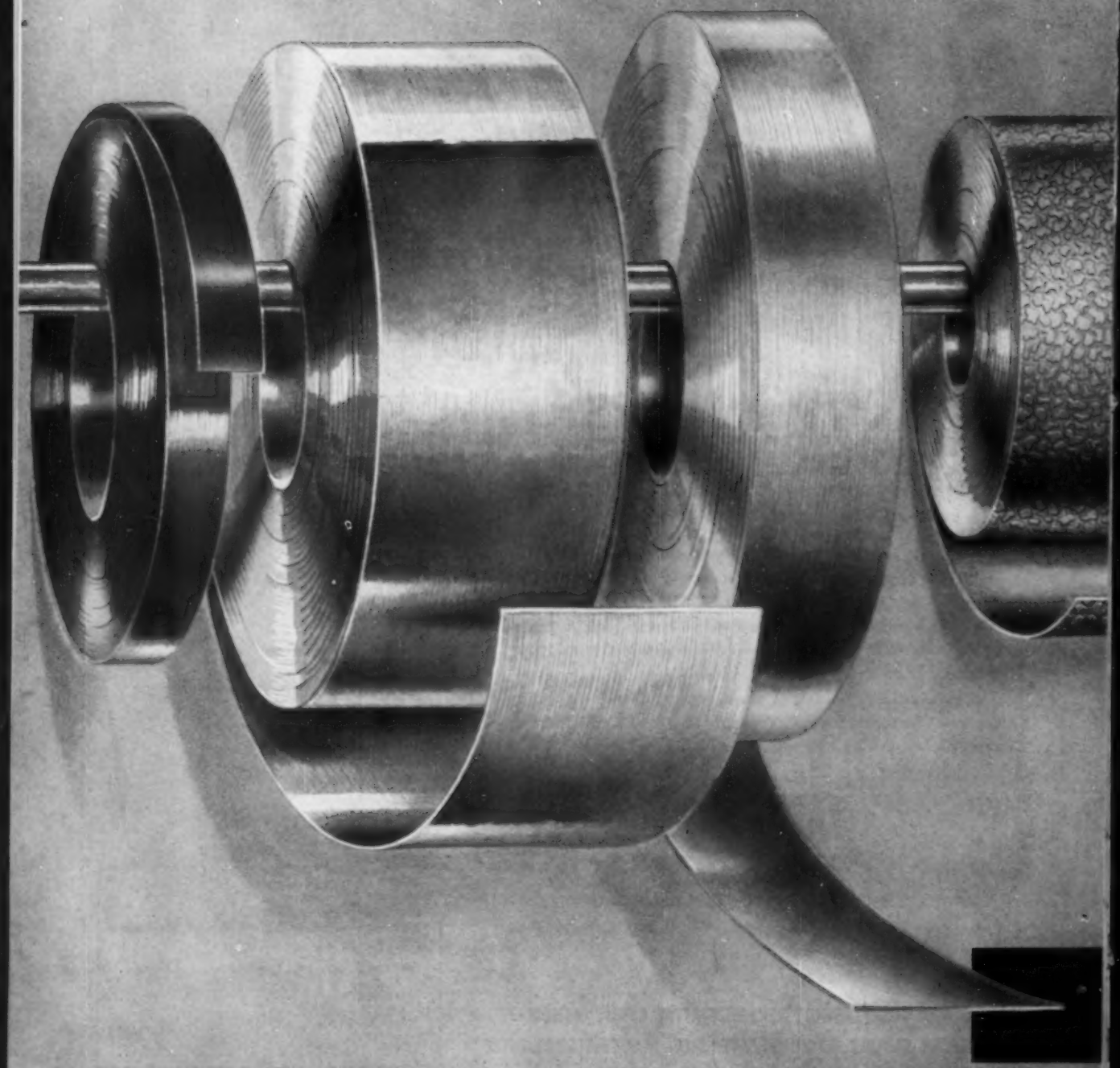

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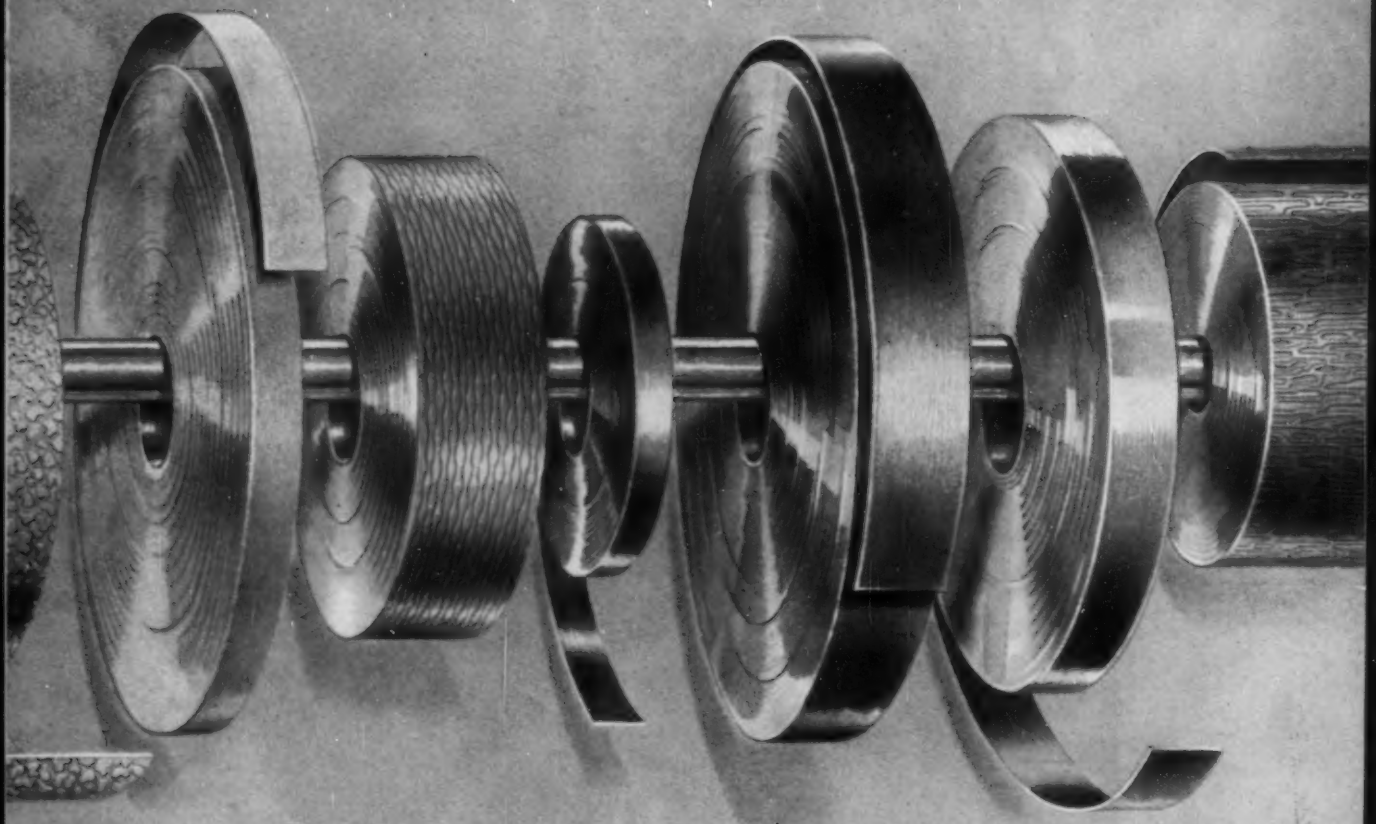

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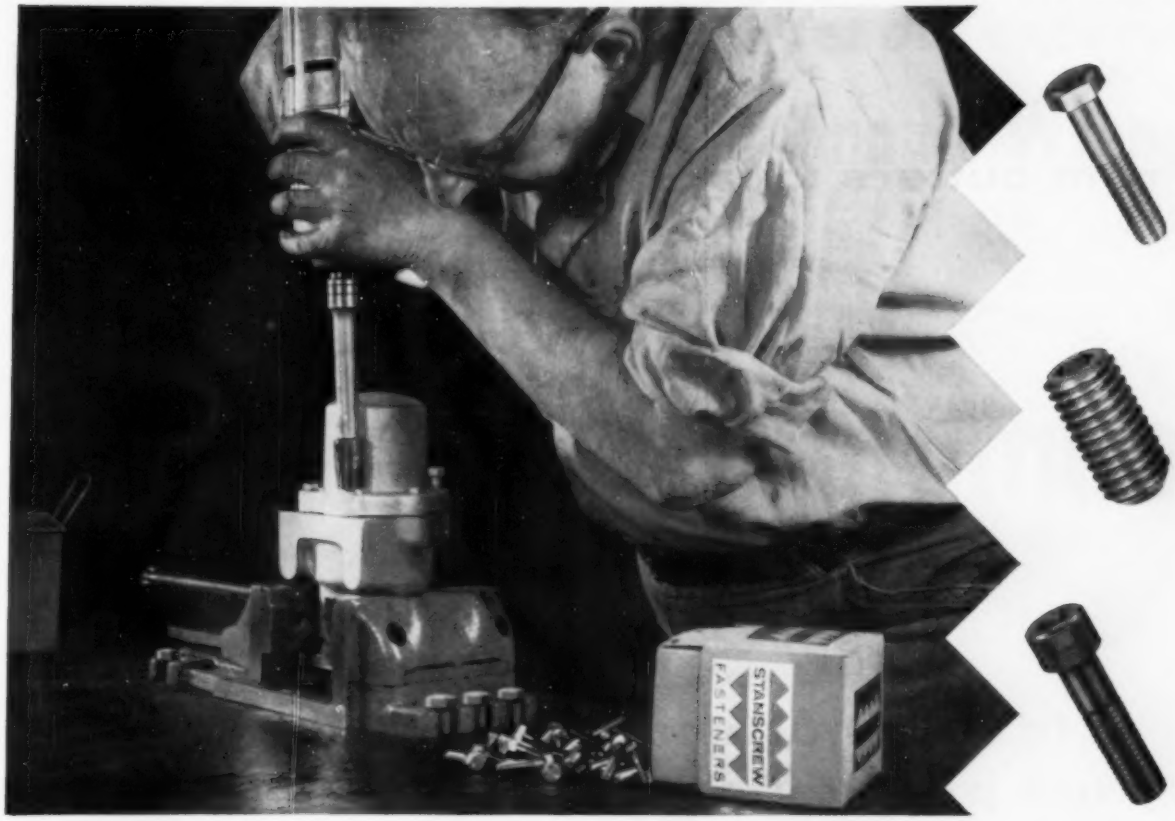

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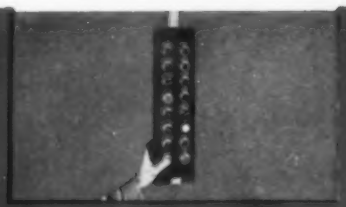

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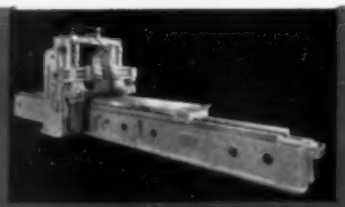

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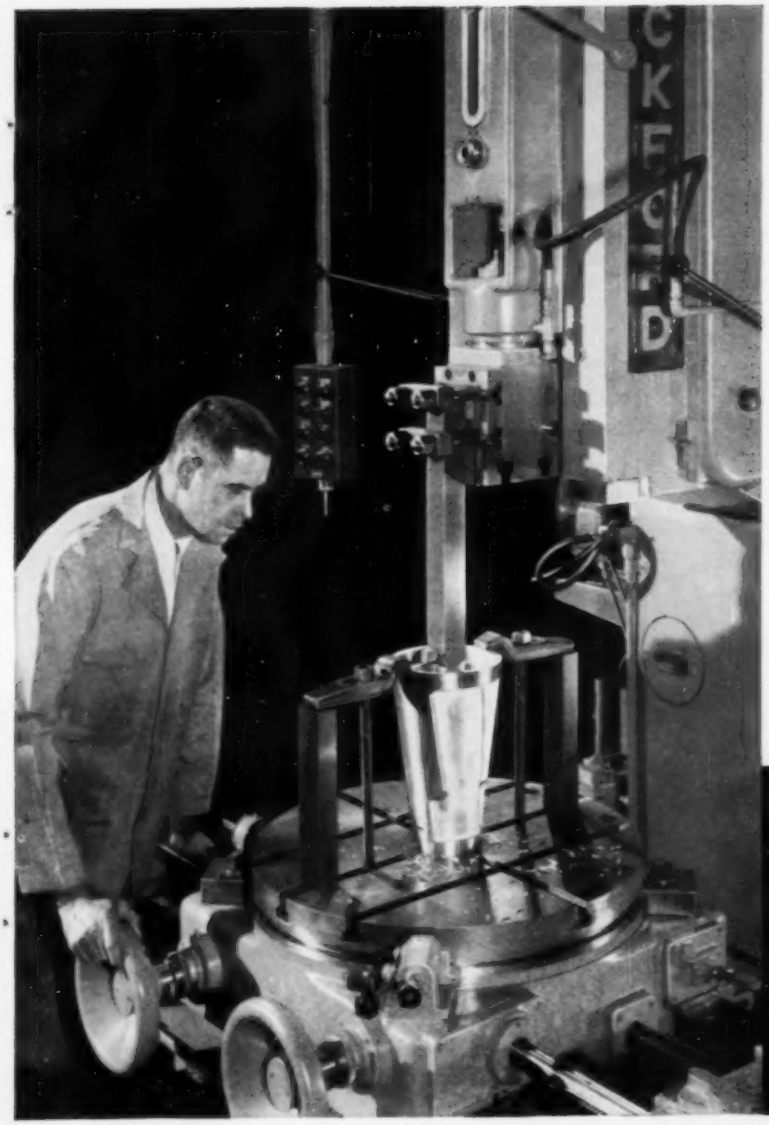

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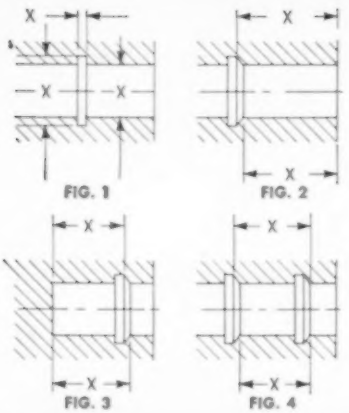

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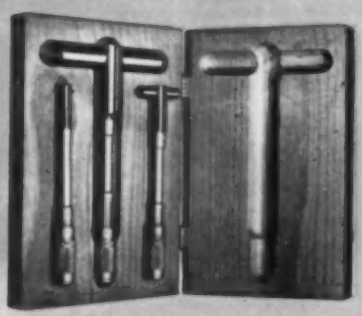

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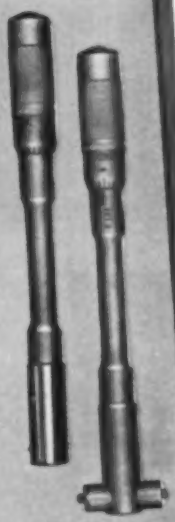
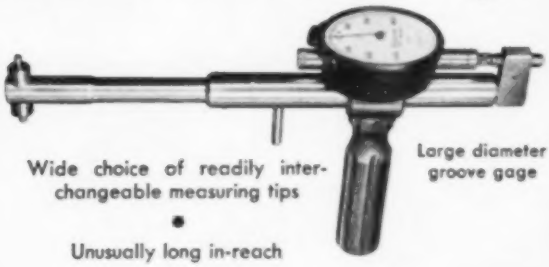


Rimat inside micrometers

RIMAT® DIAL BORE GAGES



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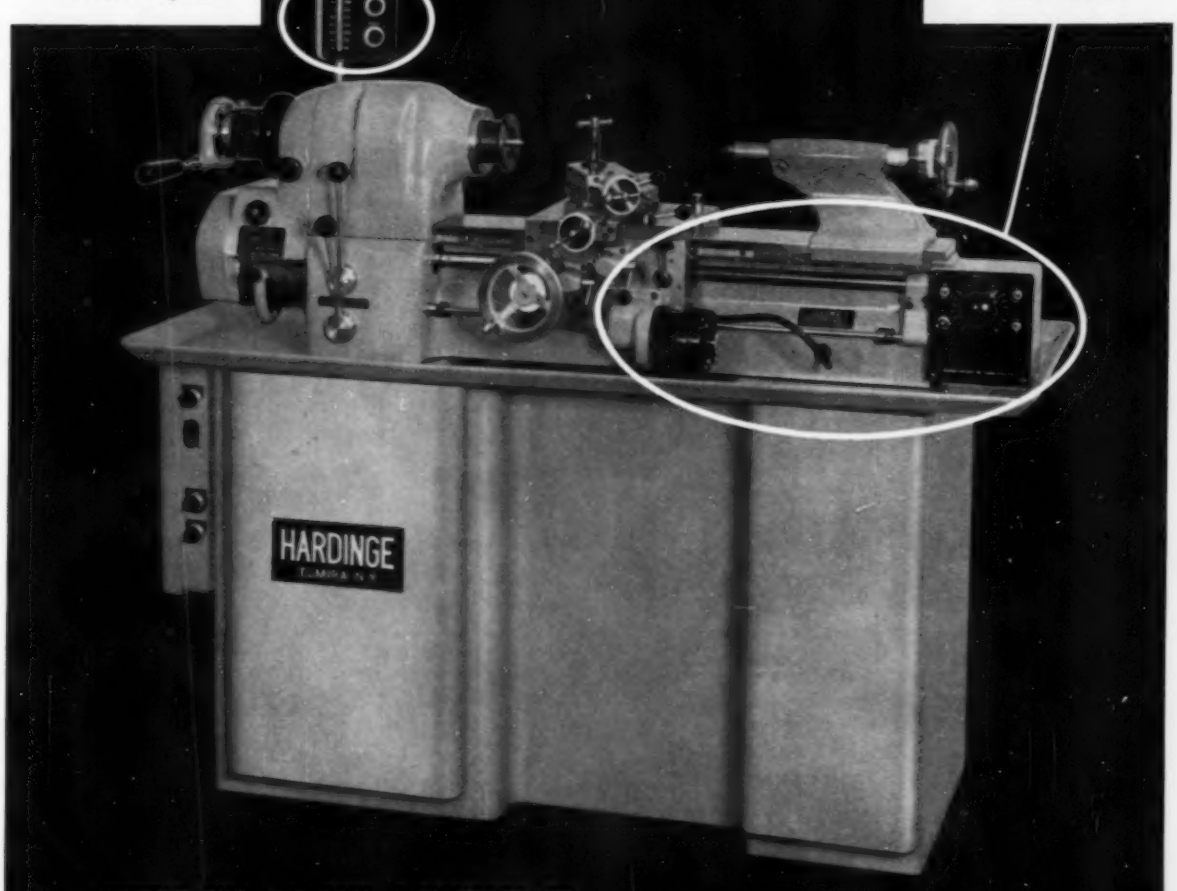

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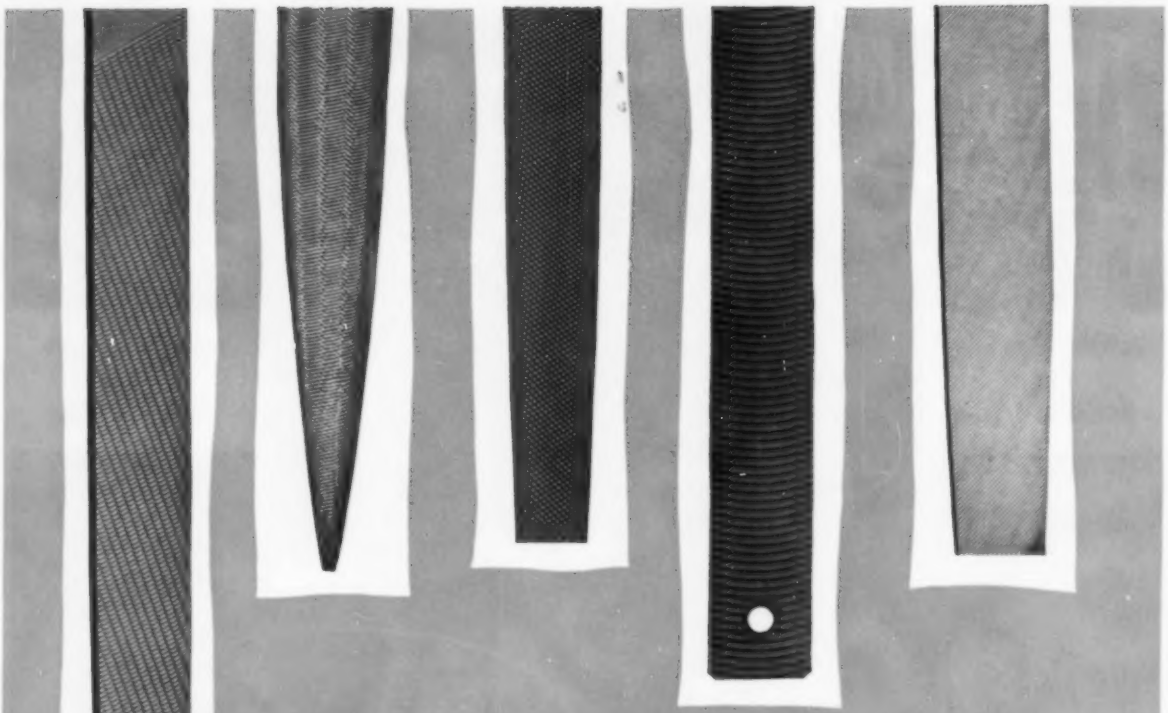

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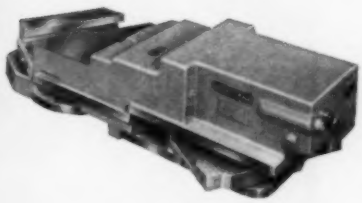
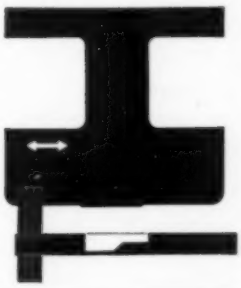
LeBlond Engineers turn trick with tracer

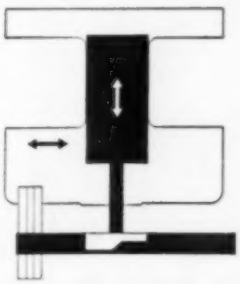


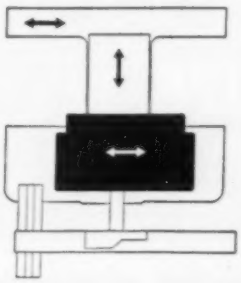
1. Problem workpiece—spiral rotor for pumps manufactured by Roots-Connersville Blower Co., Connersville, Indiana. Shaping just couldn't produce the wide variety of exact contours their engineers wanted. Could rotors be *turned*—automatically?

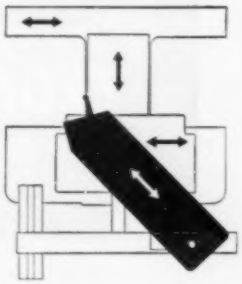
2. Why not? With special end gearing and full nut, we can "chase" the spiral shape like a coarse thread. That's easy . . . the problem is the contour.

3. We'll use Hydra-Trace to *position* the tool (not to trace). We can mount a special length slide on the cross slide to give us feed *between* cuts.







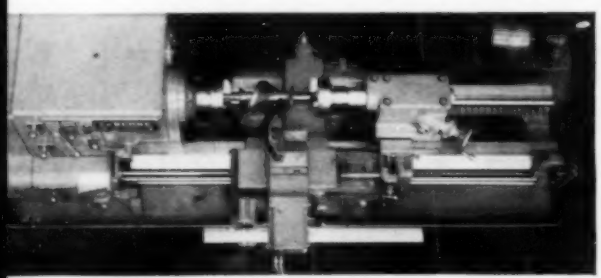


4. Let's see how this looks in plan. The carriage provides length motion for the tool. The template carrier moves lengthwise with the carriage.

5. The cross slide gives cross travel plus automatic tool relief. The template carrier also moves "in and out" with the cross slide.

6. The special length slide gives us feed. Not continuous feed. Just tool-positioning feed that moves the stylus along the template for each successive cut.

7. The template controlled Hydra-Trace positions the tool to produce the contour. During the cut, no feed takes place. Only the chasing action.



8. Here's the finished machine—the LeBlond Contour Chasing Lathe, basically a 32″ Standard Duty. Modifications include: special end gearing, full nut, special length slide, automatic cycling and special heavy duty reversing electrics. Lathe chases leads from 4½″ to 16″.

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in production – with average operators

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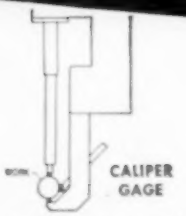
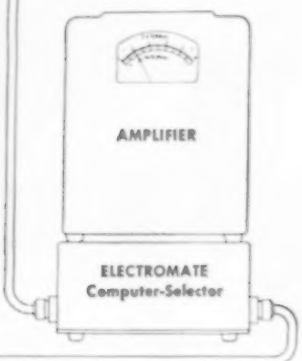
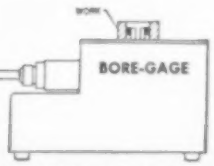


With the CEDA SIZE equipped B&S No. 5 Plain Grinding Machine, diameter readings are transmitted to Amplifier from Electronic Caliper Gage riding on work. When diameter is within about fifty millionths of finished size, CEDA SIZE lever is depressed, which produces and controls an extremely fine grinding feed. When Amplifier indicator reaches zero, the specified size has been duplicated to ±0.000010" or less.



The ELECTROMATE Computer-Selector attachment, when used with CEDA SIZE, automatically computes the differential between the internal diameter of the mating sleeve (set on Electronic Bore Gage) and the external diameter of the part being ground. When indicator reaches zero, clearance (preset with masters) has been duplicated to ±0.000020" or less.



In addition to CEDA SIZE and ELECTROMATE the No. 5 Plain Grinding Machine shown is also fitted with ELECTRALIGN (upper rear amplifier) to insure easy, accurate control of taper.

If you're in a hole . . .

BECAUSE OF GRINDING WHEEL PROBLEMS, there's an easy way to get back on top of the situation. Switch to CINCINNATI (PD)° WHEELS. *Now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and* increase your production.

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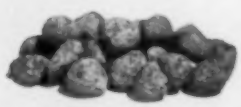

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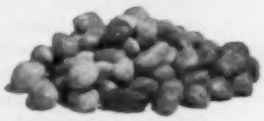
ALUNDUM TUMBLEX "S" Abrasive. Bonded spheres that get into areas where other shapes can't reach. Exceptionally dense and long lasting. Five sizes.



TUMBLEX "N" Abrasive. Natural stones, exclusively Norton. For high lustre, especially on die castings and soft metal. Rounded shape brings up highest lustre. Seven sizes.

G-341

If you're still finishing metal parts the long, hard way, now's the ideal time to find the fastest, most effective barrel finishing equipment, methods and abrasives.

For example, one leading aircraft parts manufacturer reports saving over $90,000 yearly by shifting from hand-finishing to barrel finishing with Norton TUMBLEX abrasives.

There's one sure way for you, too, to get these cost-cutting, product-improving "Touch of Gold" advantages. Your metal parts can range from tiny needles to hefty forgings . . . may be simple or complicated, hard metals or soft . . . may require deburring, descaling, better color and closer finish. Just send sample parts to our Sample Processing Department. They'll be returned to you completely finished to requirements, with a detailed report. Or, next time you're in our area, drop in and learn how your finishing can be improved.

NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines
Refractories
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes

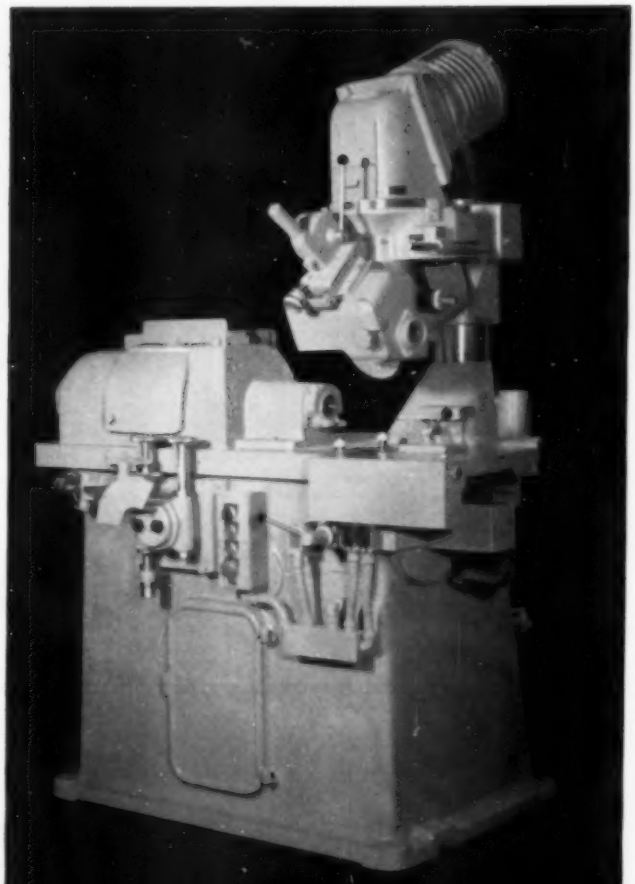
New No. 4-4 Sharpening Machine Features—

INFINITELY VARIABLE TABLE SPEEDS,

Air-Draulic actuation provides convenient power, smooth operation, minimum maintenance.

This new No. 4-4 Sharpening Machine is an automatic sharpening machine for sharpening hobs and form-relieved cutters. It has air-draulic table actuation, adjustable stroke length, infinitely variable table speeds, and built-in wheel dresser for work up to 4" diameter and 4" long. It offers convenient set-up and reduced sharpening time, with positive mechanical control over all sharpening elements. Spacing, lead of flute and radialism are held within tolerances for all accuracy classifications including Class AA hobs.

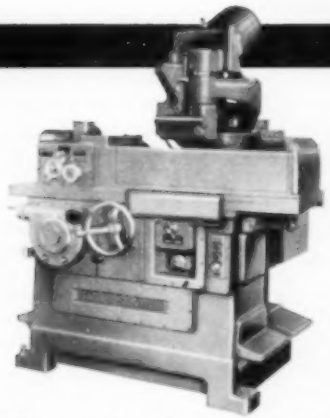
The new closed air-draulic system has no piping, hydraulic motor or tanks. Leakage is not a problem as with most hydraulic systems. The air-draulic system connects readily with compressed air lines available in most shops. This combination of air and hydraulic pressures provides smoothness and infinite adjustment in machine operation, and offers cost advantages in machine maintenance. Table speed is adjustable from 5 to 35 strokes per minute at a 7¾" stroke. Length of stroke can be adjusted from 3" to 7¾". Wet grinding is optional at extra cost.



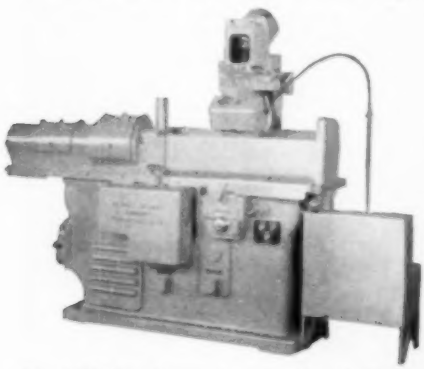
New Model No. 4-4 Automatic Sharpening Machine reduces set-up and sharpening time through stroke control and infinitely variable table speeds.

Your present machines may be factory-rebuilt! If you have No. 4-4 Automatic Sharpening Machines in your shop, Serial No. 100 or later, you may have them completely rebuilt at the factory, incorporating these new machine features and air-draulic system. Factory rebuilt machines have all of the features of a new machine, and carry a new machine guarantee. Write Dept. 13 for details and estimate of cost for rebuilding your present machines. New illustrated bulletin supplies complete information on new machines.

ADJUSTABLE STROKE!



No. 6-5 is a precision sharpening machine, with wet grinding as a standard feature, making it ideal for sharpening carbide tools. Takes work up to 6" dia. x 5" long.



No. 10-12 is a heavy duty machine, built to accomodate work up to 10" dia. x 12" long. Wet grinding attachment is available as extra equipment.

Hob and cutter sharpening is on a production basis with Barber-Colman automatic sharpening!

Barber-Colman Sharpening Machines sharpen hobs and cutters cheaper, faster and more accurately than can be done by any other method. They provide repeat accuracy and automatic operation for either large run or job-lot sharpening. Accurate sharpening is important to tool life, and must be maintained if the tools are to cut accurate parts. In addition to the newly improved No. 4-4, two other sharpening machines are built by Barber-Colman to provide a complete range of sharpening for hobs and form-relieved cutters up to 10" diameter by 15" length. If you have hob or cutter sharpening problems, consult Barber-Colman engineers for help in meeting production requirements.

BARBER-COLMAN COMPANY

614 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

du MONT
time-saving
TOOLS

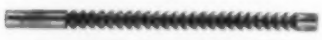
Minute Man
KEYWAY BROACH KIT

In one minute and for as little as one cent you can cut a keyway with this kit. For keyways from 1/16" to 1" in any bore from ¼" to 3".

Minute Man

SQUARE BROACHES

HEXAGON BROACHES



New ROUND BROACHES

Used in an arbor or hydraulic press for finishing holes to exact size in *one pass*. ⅛" to ¾" squares and hex's; ¼" to 1" rounds. Production Type Keyway Broaches also in stock.

duMONT TOOL BITS

High Speed Ground, Square and Rectangular. Hold a keener cutting edge longer due to "balanced" toughness, red hardness and wear resistance.

see them at BOOTH 139 ASTE SHOW

The duMONT CORPORATION
Greenfield, Massachusetts

Mail complete information and Price List A.

☐ Minute Man BROACHES and KITS
☐ duMONT Super H. S. TOOL BITS

Name.....

Company.....

Address.....

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Fireplace screens

Dear Sirs:
We were surprised to read your comments regarding the fireplace screen looms made by Bennet-Ireland for their own use (*AM*—Feb 24 '58, p124).

After having read this article, one cannot help but arrive at the conclusion that, per se, any mesh not woven on the Bennet-Ireland machines is difficult to cut and fit, is not attractive, and is not durable.

You should be aware of the fireplace screen looms manufactured by WAFIOS of Germany, which weave, cut, and knuckle on the same machine and which can be adjusted in increments of ½ mesh to eliminate the cutting and fitting for custom installations.

It is true that many years ago, manufacturers did modify mattress looms to weave firescreen mesh, but this method is very obsolete and used only by the marginal producers. Today, a very substantial part of the firescreen mesh used here is woven on the WAFIOS fully automated looms.

So far as attractiveness and durability are concerned, a screen can only be as attractive as the pattern by which it is woven, and as durable as the quality of the metal from which it is woven.

H E Fielder
Kurt Orban Co, Inc
New York, NY

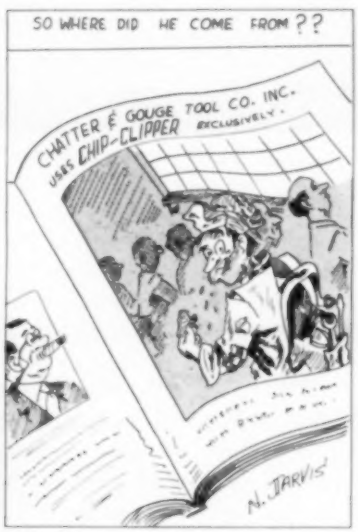
Car troubles

Dear Sirs:
Your editorial, "No Excuse for Shoddy Products" (*AM*—Feb 24 '58, p93) is timely and should be heeded, especially by the makers of automobiles at this time. I have been following automobile production since the days of the round-dash Olds when R W Olds showed me through his shop.

Over the years there has been great improvement in the accuracy of the parts that go into modern cars. It is possible that sub-assemblies made by automat-

SHOPMATES

N. Jarvis



This "SPECIALIZED" Leland-Gifford

DRILLS DEEP HOLES IN DIE CASTINGS

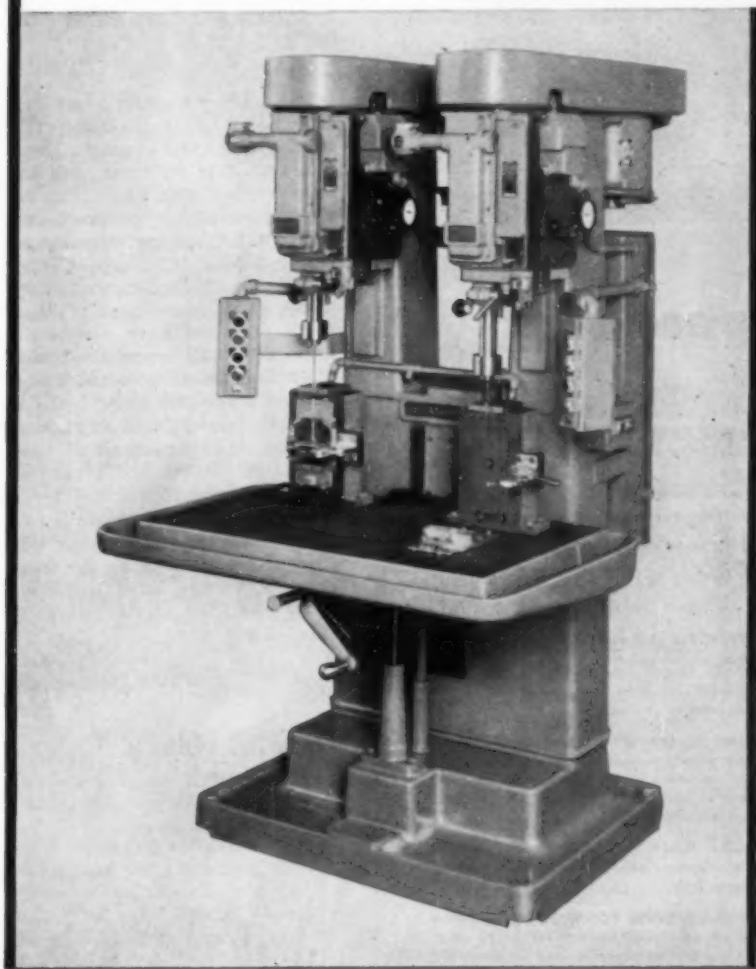
at 250 pieces per hour

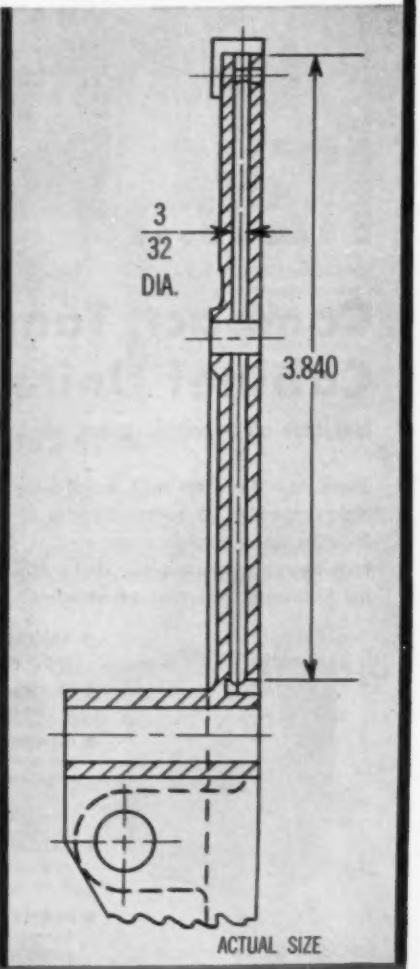
Small diameter deep holes . . . drilled to precise depth to meet an existing cross hole . . . through thin sections of die cast aluminum — this is a job on which you would settle for accuracy and not expect quantity production. But Leland-Gifford developed this two-spindle drilling machine that delivers both performance *and* production . . . proving once again that you never know how effectively a drilling problem can be solved until you talk to Leland-Gifford.

DO IT RIGHT and DO IT FAST...

Two self-contained drilling units are mounted on a standard pedestal over twin work-holding fixtures. Hydraulic feed with step by step control assures fast, automatic drilling to accurate depth and dimension.

Call in your nearby Leland-Gifford sales engineer.





LELAND-GIFFORD
SPECIAL
DRILLING MACHINES

WORCESTER 1, MASSACHUSETTS
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Vernon 58, Cal.
Indianapolis 6, P. O. Box 1051
Rochester 12, P. O. Box 24, Charlotte Station

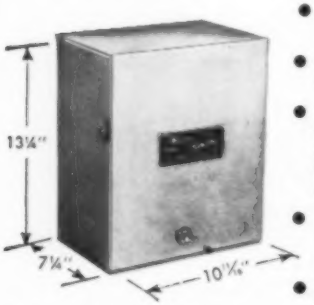
Norgren MICRO-FOG LUBRICATION

NEW...

Compact, Tamper-Proof Cabinet Units

lubricate all bearings, gears, chains and cams on a machine

These new Norgren units provide ideal lubrication by applying just the right amount of air-borne oil fog to all bearing surfaces. The standard unit includes an automatic-drain air line filter, a solenoid valve, a pressure regulator, a pressure switch and a MICRO-FOG Lubricator... *and provides the following important advantages:*



1 QT. OR 2 QT. OIL CAPACITY

200 OR 300 BEARING INCH RATING

- **TAMPER-PROOF**—Totally enclosed key-locked cabinet prevents tampering.
- **SPLASH-PROOF**—Coolant and corrosive liquids cannot reach interior of enclosure.
- **CONVENIENT TO SERVICE**—Removable one-piece top and side panel—secured by key lock—provides easy access for authorized personnel. Visual oil feed is proof of lubrication. Oil level gauge glass provided on lubricator.
- **SAFEGUARDS MACHINE COMPONENTS**—Pressure switch actuates alarm or shuts down machine if air pressure fails.
- **HEATER AND OIL LEVEL CONTROL OPTIONAL**—Thermostatically-controlled Heater, for 1 Qt. units, maintains lubricant temperature and viscosity. Oil level control actuates alarm or stops machine when oil needs replenishing.

For complete information, call your nearby Norgren Representative listed in your telephone directory—or WRITE FACTORY FOR NEW No. 900 CATALOG

C. A. NORGREN CO.

If it's Norgren... It's Dependable.

3436 SOUTH ELATI STREET ENGLEWOOD, COLORADO

ed machines are better than could be made by hand. There is however great dissatisfaction among dealers and customers as to the lack of care in the final assembly of new cars.

Dealers tell me of the many adjustments they have to make or missing parts they have to supply to keep customers happy. Several high-priced cars I know of have given trouble for months until the owners were so disgusted they bought another make.

Some dealers are allowed a given sum to make the cars usable to the satisfaction of the buyer. Inside trim has been omitted; cigar lighters have not been installed; turn indicator connections not made; and other things, easy enough to do properly on the assembly line but not in the dealer show room.

The makers are said to be seriously considering making really small cars in this country. There is a real field for them. But the auto people should profit from the experience of foreign small cars and put in four-speed transmissions instead of three as they have done in England and Germany. My sons drive foreign small cars and have driven the American small cars made abroad. They find the three-speed transmission a real handicap.

I have driven steam cars, Model T's, and up to the largest we have made. A 100-hp car gives me speed enough to break any speed law we have. A small car is easier to park and on present-day roads rides as well as the huge chariots we now have. But there is no room for shoddy work on cars of any size.

Fred H Colvin
Point Pleasant, NJ

Helpful Henry

by L. Hoppes

"Friendly, isn't he? Thought we could use a pet around here."

CALENDAR

American Welding Society—Annual Meeting and Welding Show, Apr 14-18, Kiel Auditorium and Hotel Statler, St Louis, Mo.

Design Engineering Show and concurrent ASME Conference on Design Engineering, Apr 14-17, International Amphitheatre, Chicago, Ill.

AIEE, ASME, IRE—Joint Conference on Automatic Techniques, Apr 14-16, Hotel Statler, Detroit, Mich.

Metal Powder Association—Annual Meeting and Powder Metallurgy Show, Apr 21-23, Sheraton Hotel, Philadelphia, Penna.

National Screw Machine Products Association—Annual Meeting, Apr 30-May 3, Drake Hotel, Chicago, Ill.

American Society of Tool Engineers—Tool Show and Annual Meeting, May 1-8 (closed Sunday), Convention Center, Philadelphia, Penna.

National Tool & Die Manufacturers Association—Spring Meeting, May 3-6, Hotel Statler, Washington, DC.

American Society for Metals — Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention and Exhibition, May 26-28, Madison Square Garden, New York, NY.

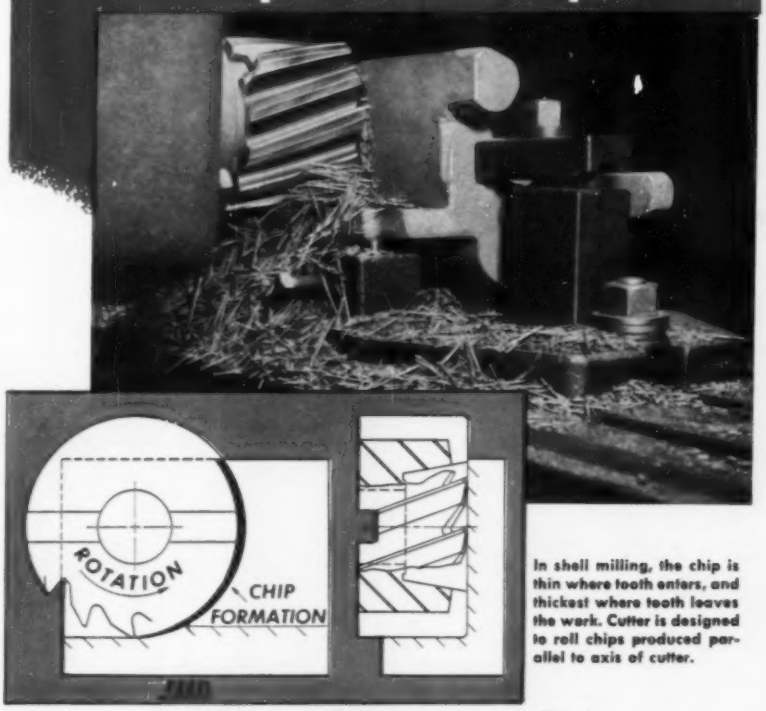
Society of Automotive Engineers —Summer Meeting, June 8-13, Chalfonte-Haddon Hall, Atlantic City, NJ.

National Materials Handling Exposition and concurrent ASME conference on Materials Handling, June 9-12, Public Auditorium, Cleveland, Ohio.

American Institute of Industrial Engineers — National Conference and Convention, June 12-13, Hotel Statler, Los Angeles, Calif.

American Society of Mechanical Engineers—Semi-Annual Meeting, June 15-19, Hotel Statler, Detroit, Mich.

Cutter Design Pays off in Chip Size... Shape!



In shell milling, the chip is thin where tooth enters, and thickest where tooth leaves the work. Cutter is designed to roll chips produced parallel to axis of cutter.

Mill 2 surfaces... with 1 High Speed Steel Cutter

You can often save time and money by machining two surfaces at once with one shell end mill. But this milling economy is impossible without an accurate, rigid cutter capable of producing a good finish on both work surfaces.

A correctly designed cutter will make the long continuous chip shown here, giving a cooler running cutter and a superior surface finish. Brown & Sharpe Shell End Mills are PRODUCTIONEERED with correct rake angles and precision ground chamfered edges—for smoother chip flow, longer cutter life.

Don't let "almost-as-good" high speed steel cutters steal your milling profits! For top performance, economy and reliability, always specify Brown & Sharpe PRODUCTIONEERED Cutters.

Write—Cutting Tool Division: Brown & Sharpe Mfg. Co., Providence, R. I., for Cutting Tool Catalogs.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe

CUTTING TOOL DIVISION

NELCO CARBIDE TOOLS BS HIGH SPEED STEEL CUTTERS

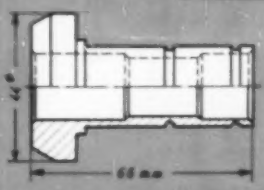
PRECISION TOOLS AND GAGES
MACHINE TOOL ACCESSORIES
MILLING GRINDING AND SCREW MACHINES
GEAR VANE AND CENTRIFUGAL PUMPS

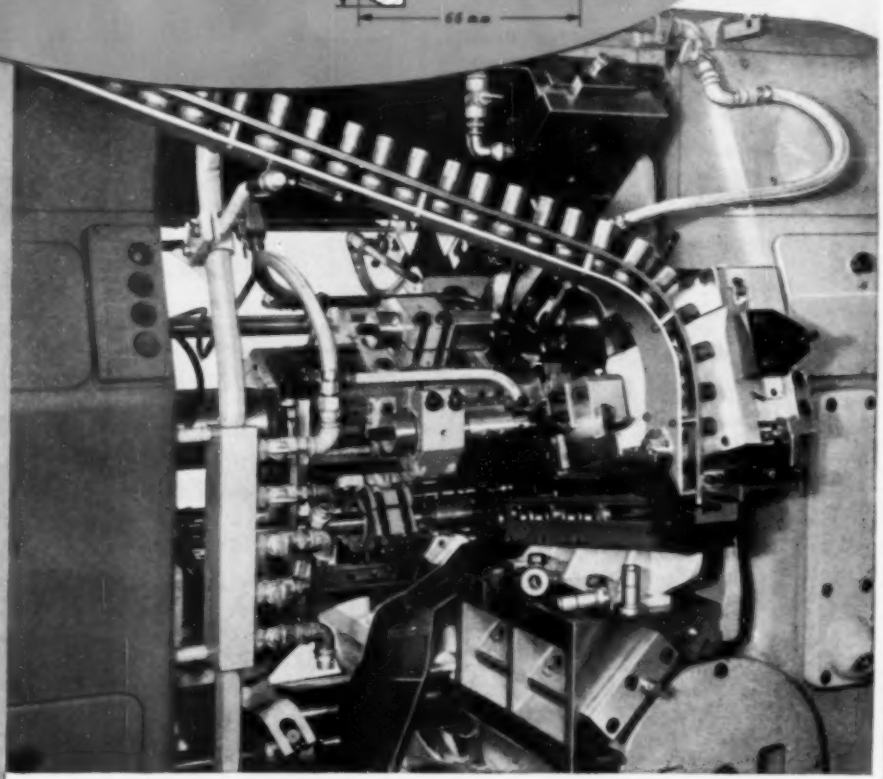
BOOTH No. 126 ASTE SHOW

All 'round the world...

HOW ACME-GRIDLEY BASIC DESIGN SAVES TIME IN GERMANY

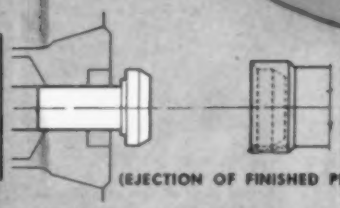
Automotive sleeve produced in West Germany on a German-built 6 Spindle Acme-Gridley Automatic. Machining is performed in 27.3 seconds, a saving of 30.6% of the time used by previous methods.





RÜCKANSICHT MIT MAGAZIN EINRICHTUNG
REAR VIEW WITH MAGAZINE LOADING ATTACHMENT

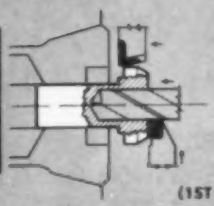
6TH POSITION



(EJECTION OF FINISHED PIECE)

MAGAZINE LOAD (1ST OPERATION)

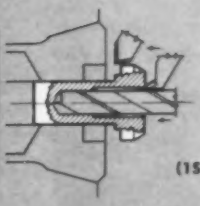
1ST POSITION



(1ST OPERATION)

ROUGH TURN HEAD
FACE
DRILL LARGE HOLE

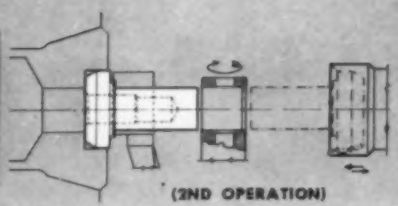
2ND POSITION



(1ST OPERATION)

FINISH TURN HEAD
CHAMFER INNER DIAMETER
DRILL SMALL HOLE

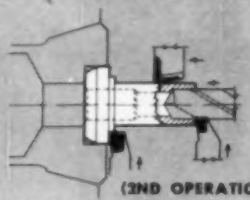
3RD POSITION



(2ND OPERATION)

TURN OVER AND RELOAD

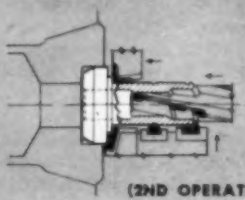
4TH POSITION



(2ND OPERATION)

TURN SHANK DIAMETER PARTWAY
FACE BACK OF HEAD
FACE END OF SHANK • DRILL

5TH POSITION



(2ND OPERATION)

TURN SHANK DIAMETER REMAINDER • FINISH FORM COLLAR BACK OF HEAD AND GROOVES • FINISH DRILL TWO DIAMETERS WITH STEP DRILL

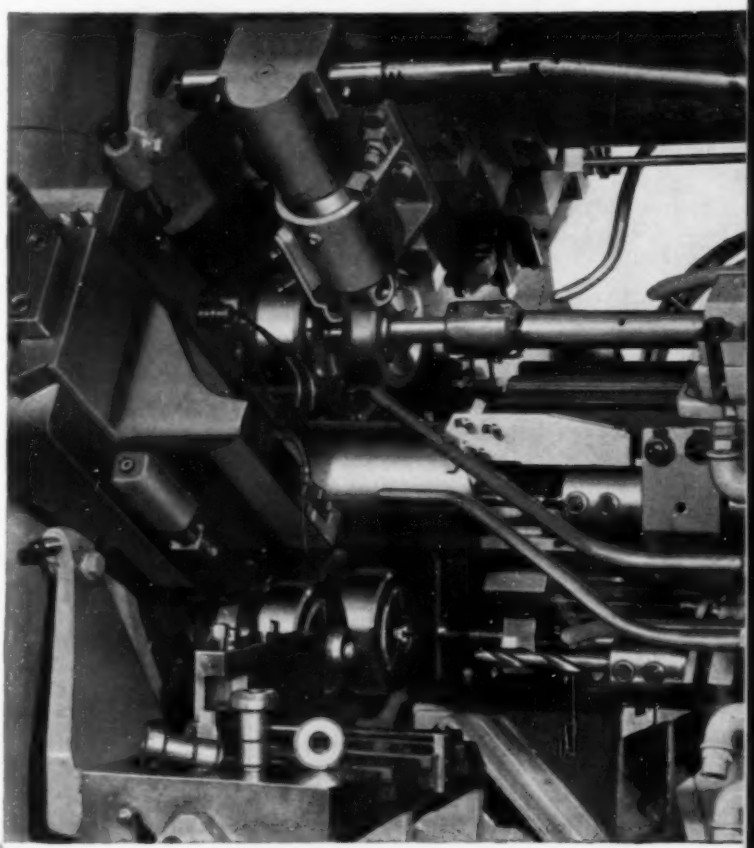
. . . where there's work to be done and time to be saved . . .

there's an Acme-Gridley to do it!

In the metal working plants of Essen and Hamburg you'll often hear the phrase ***Schnellste Automatiche Fertigung.*** Chances are, ***mit Acme-Gridleys,*** is added for ***Schnellste Automatiche Fertigung*** means high speed automatic production and all 'round the world the use of Acme-Gridley Automatics results in high speed production ***and*** greater precision in metal working.

The illustrations show the production of an automotive sleeve which is tooled from an upset forged blank fed into the German built Acme-Gridley by a magazine loading attachment. After one end of the part is machined it is turned end-for-end by a special attachment and then the other end machined—the part completely finished.

This high speed—high quality production is typical of the way Acme-Gridley circumferential automation makes things faster—better—cheaper—all 'round the world. That's why we say "When there's work to be done and time to be saved, there's an Acme-Gridley to do it".



WENDE EINRICHTUNG LAGE 3
TURNING ATTACHMENT POSITION 3

why don't you
INDEX . . . to lower machining costs . . . with *Acme-Gridley*
CIRCUMFERENTIAL AUTOMATION

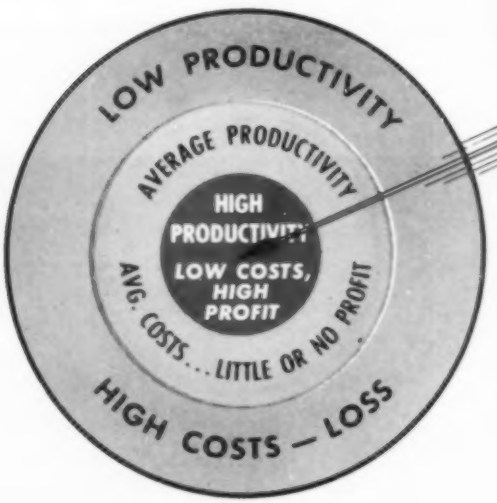
National Acme

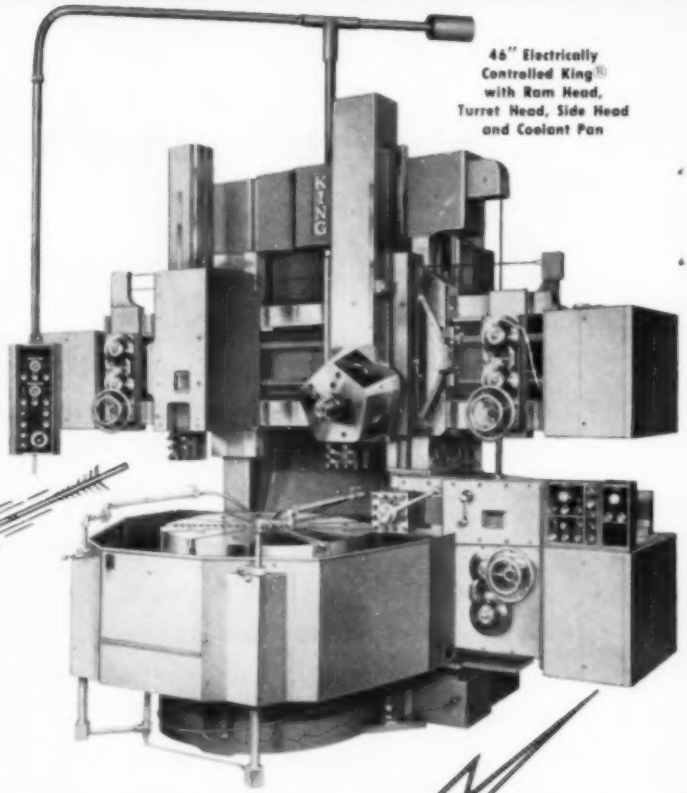
THE NATIONAL ACME CO.
171 EAST 131ST STREET
CLEVELAND 8, OHIO

Sales Offices . . . Newark, N. J. . . . Detroit, Mich. . . . Chicago, Ill.

IF YOU DON'T HIT THE "BULL'S EYE"

...You Can't Win the Game!





46" Electrically Controlled King® with Ram Head, Turret Head, Side Head and Coolant Pan

High productivity is the one and *only* way to victory in today's intense competition in metalworking. This is the "bull's eye" you must hit in order to get lower production costs with resultant maximum profit.

You will be "on target" when you put your boring, facing, and turning jobs on the new King® *Electrically Controlled* Vertical Boring and Turning Machine. This new King is designed and built to bring boring mill users advanced, vitally-essential competitive advantages—in faster set-up . . . faster operation . . . higher, uniformly maintained accuracy . . . *greatly increased productivity.*

Full electrical control cuts manipulation time to a bare minimum in both set-up and operation. Increased horsepower and expanded feed and speed ranges cut machining time and provide greater job versatility. Extra-heavy rugged construction and simplified design assure exceptionally low maintenance cost.

To "hit the bull's eye" of profits on your boring, facing, and turning operations, see your authorized King Distributor, or write us direct.

Full Electrically Controlled KING

HAS ALL THESE ADVANCED FEATURES—AND MANY MORE!

- **COMPLETE ELECTRICAL CONTROLS**—conveniently located on movable pendant station and machine-mounted panel.
- **INCREASED HORSEPOWER**—40 and 50 H.P. on 30", 36", and 46" sizes, 75 and 100 H.P. on sizes 56" and up—available in any one of three speed ranges.
- **EXPANDED FEED AND SPEED RANGES**—24 feeds from .0016" to .250" per revolution. 24 speeds in any one of three standard ranges—low, intermediate, or high.
- **DIALS FOR PRE-SELECTION OF FEEDS AND SPEEDS.**
- **IMPROVED SPINDLE MOUNTING**—with extra-heavy spindle, provides maximum table stability with resulting higher, uniformly maintained accuracy.
- **AUTOMATIC LUBRICATION of all moving parts.**
- **MACHINE ADAPTED FOR OPTIONAL ADDITION OF:** Automatic feed stops . . . Automatic cycling . . . Automatic tracing control of heads . . . Power indexing of turrets.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

SPOT NEWS...

- **Complaints that primes are hanging onto missile business** that should rightfully go to small subcontractors were made at a recent meeting of the Ohio group of the Association of Missile and Rocket industries. Cited was the case of a major company that received a several-million-dollar contract for guidance systems. Instead of farming out orders to instrument makers, the firm set up a 50-man team to take over the instrument business involved for itself.
- **Monthly telegraph survey of employment in 1000 key companies** may soon be set up by the Labor Dept. Firms would wire in figures on the first Monday of each month, results would be tabulated, released a day later. Current report on employment takes 3 weeks, is outdated when issued.
- **California may exempt ships under construction** from personal property taxes in a legislative move to help California shipyards compete with those of other states, which do not levy such taxes. The tax has been largely responsible for a drop in California shipyard employment from 250,000 workers in peak 1945 to 12,000 today.
- **A $35-a-week strike fund has been authorized** by International Association of Machinists' members, who recently voted 110,187 to 65,891 to have their monthly per capita tax increased 70% for this purpose.
- **Cramet Inc, one of the nation's largest producers of titanium sponge,** is going out of business because the government has cut back its military Ti requirements drastically, and civilian use is negligible.
- **Casting, rather than sinking, of forging dies is being investigated.** Best material to date, an age-hardening beryllium-copper alloy, is said to have been cast into dies that cost 75% less than machined steel ones.
- **Look for these switches in Chrysler Corp assembly operations:** DeSoto Fireflight assembly from the Wyoming Ave to Chrysler's Jefferson Ave, Detroit, plant, and assembly of the Chrysler Imperial to the Warren Ave, Detroit, plant, which made DeSoto engines until last year.
- **Just-issued patent covers the Keeleric electrolytic grinding concept** of using a conductive grinding wheel with abrasive elements protruding from its surface. Anocut Engineering, Chicago, is licensee.
- **First successful cold extrusion of hollow titanium shapes** has been done at Battelle Memorial Institute. The shapes were produced by forward-and-backward extrusion on a 700-ton press: 1.5-in.-dia slugs of unalloyed Ti were backward cold extruded to make up 3-in.-long, 0.22-in.-thick cups. In forward extrusion, cup-shaped billets of 1.5-in. OD, ⅞-in. ID were cold extruded into 0.15-in.-thick cylinders. Surface finishes were 30 to 60 mu in.
- **Ignore rumors that Chevvy plans to enter the heavy-duty truck field** on a model-for-model basis to compete with Ford. Rumor had some basis a while back but the sales-poor GMC Division objected to the move.
- **Engineers have asked Boeing for a guaranteed minimum layoff notice** through two of their associations at Seattle and Wichita. Required notice would range from two weeks for less than three years' employment to four weeks for more than eight years' service.

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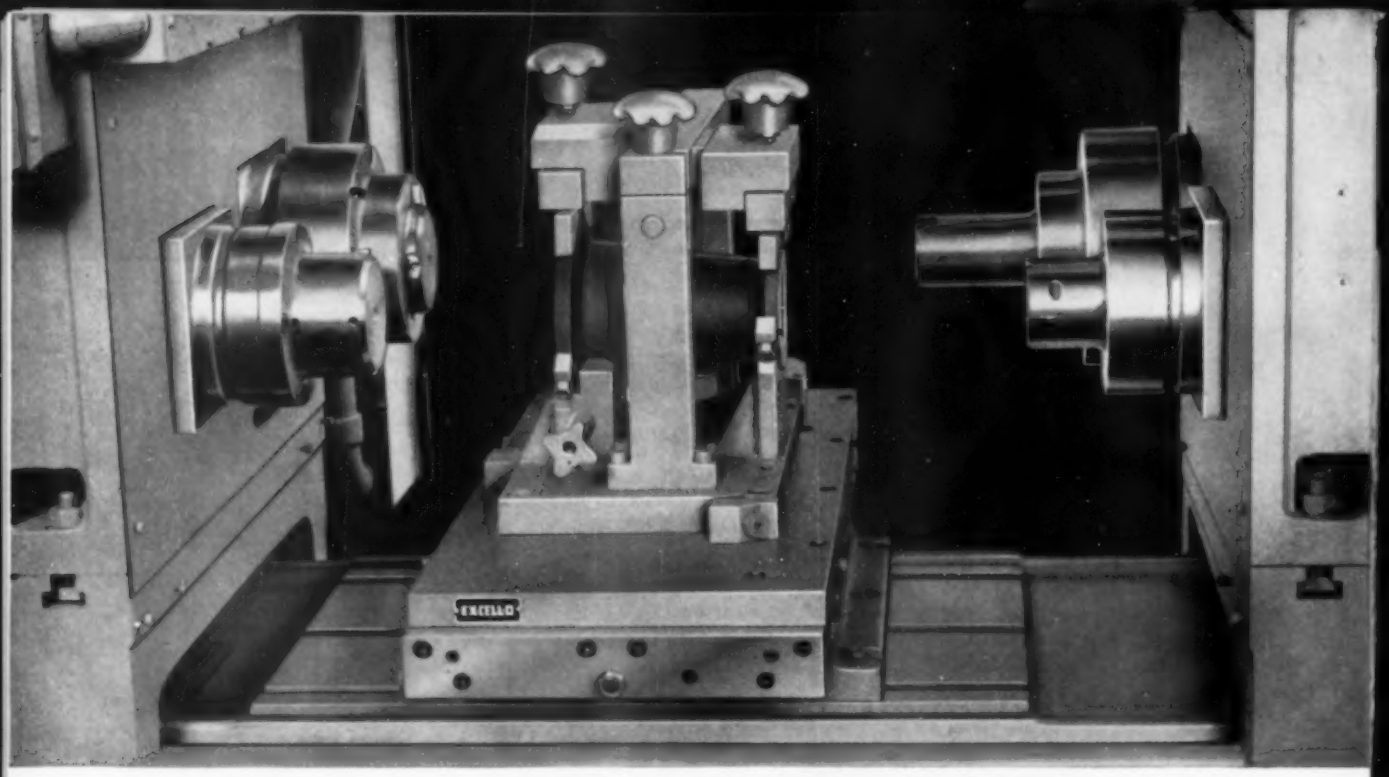


One of several fixture arrangements used for machining valve parts.

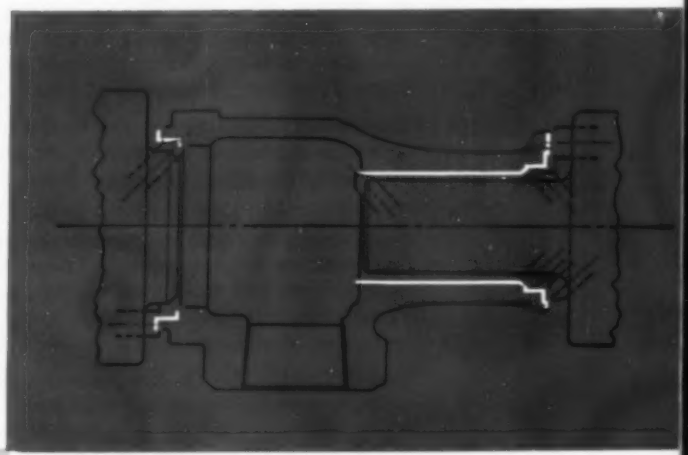
Fast and Flexible

SHORT RUN COST SAVER . . .

This Ex-Cell-O 17-A Precision Boring Machine rough bores, plunge faces, finish bores and chamfers a wide range of assorted cast-iron valve bodies and bases. Production schedules require relatively short runs of each size, so the tooling shown here has set blocks to accommodate the various parts.

Designed for medium and large size workpieces, the double-end 17-A Precision Boring Machine can handle identical operations at either end; rough at one end, finish at the other; or perform an entirely different operation at each end. So you can see the cost-saving versatility of this two-in-one machine.

Perhaps slow changeovers are inflating your production costs. If so, why not call your Ex-Cell-O Representative or contact Ex-Cell-O in Detroit.



White lines represent cuts made on a typical part.

Here are a few sizes of the valve bodies and bases processed on the Style 17-A Machine.

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57-22

WASHINGTON...

Plant expansion...

A detailed diagnosis of business's plans for new plant and equipment spending has just been completed by the Commerce Dept. It marks the first survey in which the government has asked businessmen to separate plant expansion already underway from the new starts they have planned for the year. The survey results, like last month's joint Commerce Dept-Securities & Exchange Commission survey (*AM*—March 24 '58, p97) aren't encouraging.

The Commerce-SEC survey, which was an overall one that took into account both plant expansion already underway and new starts, making no effort to separate them, showed that capital spending will run in 1958 at about 70% of 1957's total.

And while that may look bad on paper—a drop of $4 billion from 1957's $36.9 billion—it must be remembered that '57 was a record year.

But now, in the new Commerce survey that separates continuing projects from new ones in a much more detailed diagnosis, some major new disclosures have been made:

- **Manufacturers in general** will start projects this year that will cost $9.85 billion, as against new starts last year of $14.05 billion.
- **Durable goods manufacturers** intend to begin projects costing $4.02 billion this year, as against $6.42 billion in '57.

Obviously, business executives make their plans for plant expansion with an eye to what they expect to sell in the near future. So, the Survey of Current Business makes some worthwhile estimate of sales:

- **Manufacturers think their sales** will be down 2% under last year. Inside this category, here is a breakdown: electrical machinery sales will be off 1%; machinery (except electrical) down 4%; transportation equipment (including motor vehicles) will be down a whopping 12%; electric utilities sales will be up 8%.
- **Interestingly enough,** the utilities industry now expects to put more plant and equipment into place this year than last—the one banner industry in an otherwise disappointing situation.
- **Gas companies expect sales to be up by 12%** —meaning that production plant will be increased.
- **Overall, heavy goods sellers** believe that they will have a 5½% decline in sales this year.

The first figures for 1958 bear out the business man's expectations.

January figures, seasonally adjusted, show that manufacturing companies were 7% below 1957 monthly averages. Automobiles were the big factor—more than 20% below a year ago. Government economists fear that when the reports come in for February and March, the news won't be much brighter, if at all.

New contracts...

. . . for automotive vehicles have been placed by the Pentagon—the first in several years. All told, about $100 million had been placed at the time *American Machinist* went to press—with another $15-$20 million still to come. Among those benefiting: Willys Corp, Chrysler, Utica Bend Co, and Mack Trucks. Orders include some 11,000 big trucks, 4000 trailers, 250 mechanical mules, 900 smaller trucks.

This is 1958 money being spent. It will buy about the same amount of this equipment in fiscal 1959. And Army says its orders are to let the contracts "as soon as possible."

In addition, Army is placing multi-million dollar orders for such items as 90-mm self-propelled guns. They will be produced in the Midwest auto area too.

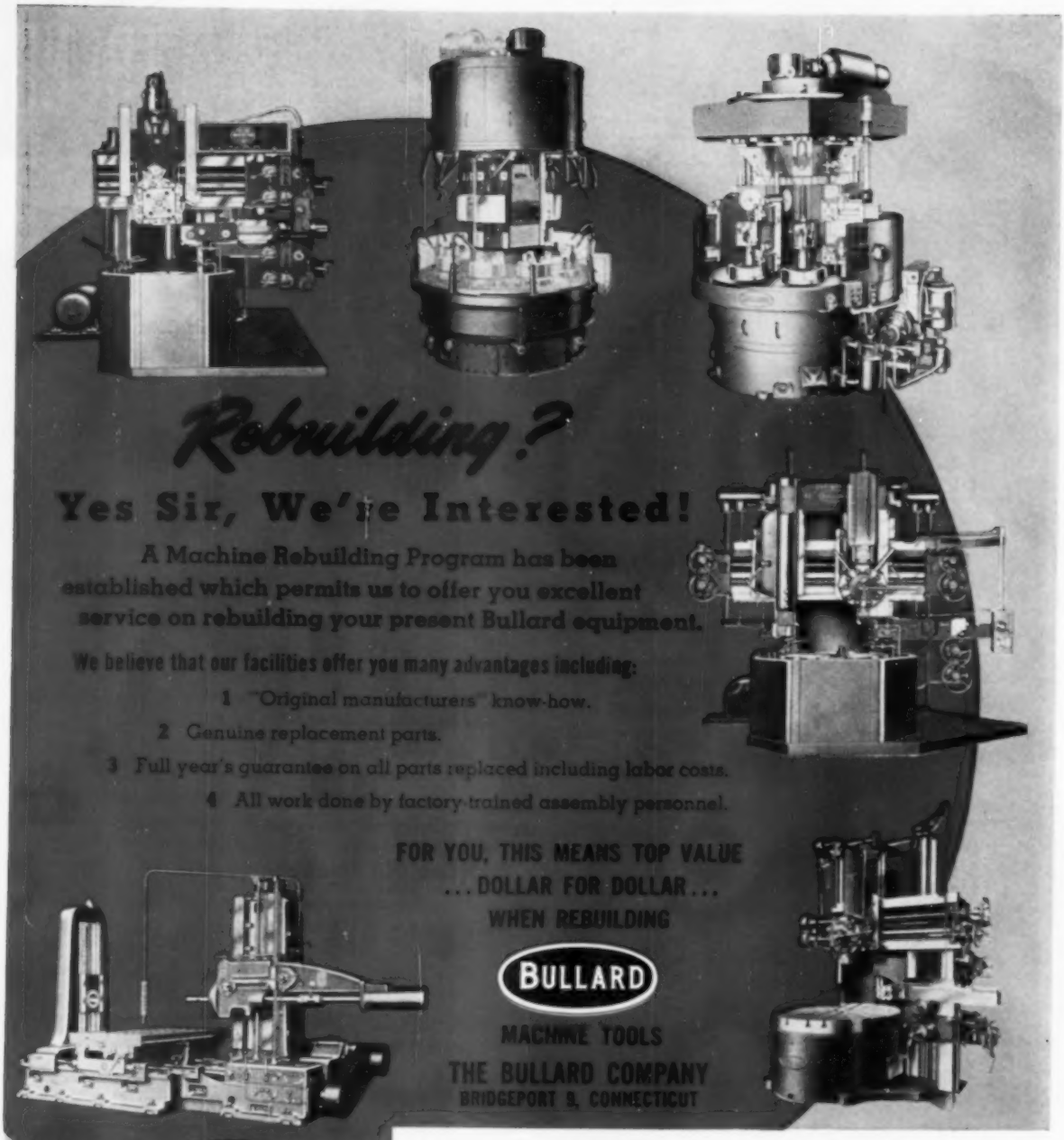
Tax cut situation...

Congressmen are coming back this week from the Easter vacation—and the big question is whether and when taxes will be reduced as an anti-recession measure. March unemployment figures will be a big factor in influencing White House and Congressional decisions.

Aside from personal income tax reductions, government leaders are also thinking along these lines, if a decision to cut is made:

- **Reduce the corporation income levy** from a top of 52% to 50%.
- **Reduce the Manufacturers' Excise Tax** on automobiles (and there is considerable sentiment for making the relief retroactive). In that case, a buyer of a car now would negotiate later with his dealer for a rebate; and the dealer would get a rebate from Detroit. To date, Eisenhower doesn't like the idea.
- **Eliminate the World War II tax** of 3% on freight transportation. It is estimated that the reduction would permit price cutting on manufactured goods all along the line, thus stimulating buying by consumers and fabricators.

Best bet on effective date of a tax cut—if one is voted: July 1.



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DETROIT...

The better mousetrap?

An interesting facet of Detroit's current doldrums is that a few makers are not suffering at all. These companies may not build better cars, but they certainly seem to be building the kind that the public wants.

Chevrolet is one. From January 1 to March 24, it produced 361,798 passenger cars, compared to 374,770 for the same period last year. The small drop is hardly significant. The same is true of Cadillac, with an output of 35,833 versus 39,333.

And at the Rambler works, where everyone wears pocket handkerchiefs bearing the legend "Business Is Good," sales for the current model year are running 67.2% ahead of 1957. These are retail deliveries—the only figure that really counts.

Also, foreign car registration figures for January, just in, show that the little imports have more than doubled their penetration in the last year, and probably many more could be delivered if ships were available.

Goodbye to wheels?

Picture yourself in Ford Motor Co's new scientific laboratories. Down the polished corridor comes white-maned Andrew Kucher, vice president and director research, riding on a hissing, tripoded contraption that moves along like a child's scooter—but without the benefit of wheels. Trailing behind is a kind of umbilical cord that ends at an air compressor.

It's all very serious. Dr Kucher is demonstrating "Glideair," his replacement for the wheel and solution to the problem of safe, landbased transportation at speeds up to 400 mph.

A full-sized Glideair would ride on "Levapads," separated from a track or monorail by a thin film of compressed air. These have already been designed to fit around and work on standard rail.

Calculations show that about 50 hp would be required to "levitate" one ton of vehicle weight, but once free of the roadbed, only 40 additional horsepower would move it forward at 100 mph.

Compressed air and thrust for forward motion would be supplied by a turbojet engine. Braking could be accomplished by reversing engine thrust, by water scoops, or by mechanical or magnetic brakes.

A Glideair vehicle weighing 100,000 lbs would require 2500 hp to levitate it and the equivalent in thrust of about 1800 additional horsepower to drive it at 400 mph. A DC6B airliner, with a similar takeoff weight, requires more than twice this power.

Front-wheel-drive back?

Vacationing Ford stylist George Walker said to a *Miami Herald* reporter: "We had the 1961 down to 52 inches the other day, but it was too low. Nobody wants to lie on his belly and drive."

Height of a current Ford Sedan is 56.2 in., and Walker was exaggerating. The main reason for the extra 4 in. is to leave room for the driveshaft.

The move of some makers towards a "Trans-Axle" will help lowness by eliminating the transmission hump on the front floor. Conceivably, engineers could go even further and retain the main section of the driveshaft in bearings and thus do away with the need for clearance space. While not impossible, this would present an awkward engine alignment problem and subject the rear universals to a very high joint angle. Because Trans-Axle is only a partial step towards the lowness desired by stylists, one major maker is taking a new, close look at front-wheel drive.

Once the decision to move the transmission is made, the tooling upheaval occasioned by moving it to the front or rear would cost about the same. The seemingly simple Trans-Axle is complicated by the necessity for either a DeDion, swing, or independent rear end set-up.

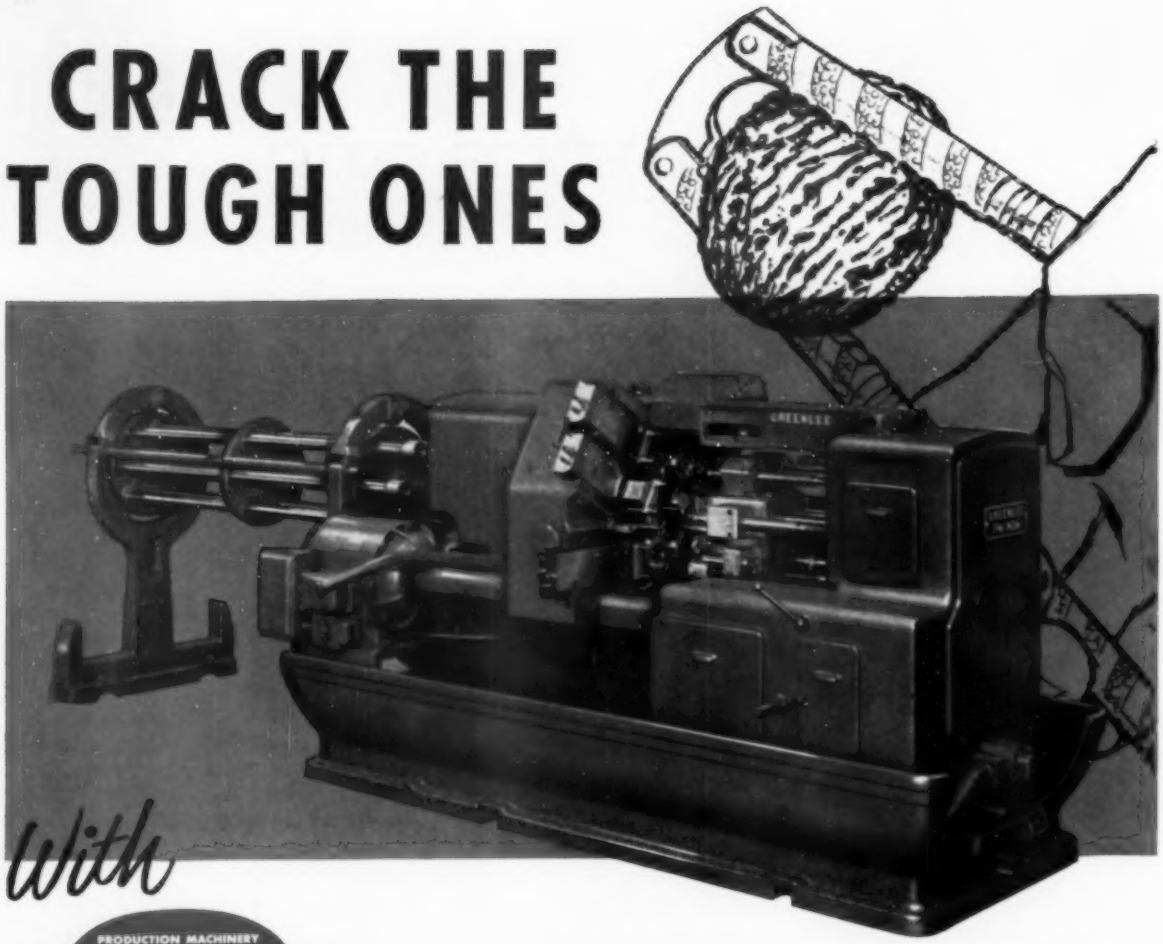
Front-wheel drive is complicated too, but it achieves the main objective. Front-wheel drive technology in this country stopped with the 1937 Cord. Car fans will remember this sleek classic as being troubled with universal joint failure and wheel alignment that varied with driving conditions.

The front wheels were set for zero toe when still. As the car accelerated, the wheels would toe in. When it coasted, they splayed out. The car never felt the same to the driver. Also, it was a poor climber on rough or wet surfaces and the driving wheels would spin with each shift in load.

Some of these deficiencies require costly remedies. Constant velocity universal joints are available today that would stand up but they are expensive. Toe correctors exist in theory, but they too are very expensive. Traction, however, is a mattor of good weight distribution and suspension design.

Still, an open-minded, fresh approach could probably solve these problems, just as Europeans have in the case of Citroen. One major company at least is not wedded to the trans-axle.

CRACK THE TOUGH ONES



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AIRCRAFT and MISSILES... TRENDS

Arma builds Titan guidance...

American Bosch Arma Corp has a new $140-million R & D contract to provide inertial guidance for the Air Force's Titan.

So far, $51 million of the money has been spent on a letter contract. The remainder is to be spent on a program extending through 1962 for research and development. *Separate contracts will be placed for production (when that stage is reached) and for manufacturing facilities.*

Ground tests of the complete Titan, designed and built by Martin at Denver, will be completed this month and the missile is expected to be flight tested before year's end. Sled tests of the inertial guidance system have exceeded Air Force expectations.

Arma's guidance system is purely inertial, with no terminal guidance. That is, it is preset on the ground and is totally self-guided from the instant of launching. There is no need for either control from the launching site or attraction to the target. Because of the presetting requirement and the ranges involved, manufacturing of control equipment establishes a new order of precision. Tolerances are in millionths of an inch. Arma expects to sub-contract 35 to 40% of the work.

Granting of the Arma contract does not cancel the previously assigned Bell Laboratories contract for the same missile. The Bell Labs guidance system is an alternate to the Arma system; it was programmed before the Air Force was certain that the Arma control was reliable.

Both systems will be used for initial tests but it is expected that, in years to come as the Arma system's reliability is proved, the Bell Labs contract will be phased out. Both contractors are operating under the technical surveillance of Ramo-Wooldridge in its capacity as coordinator of the missile program for the Air Force.

During the press conference following announcement of the Arma contract, ARDC Ballistic Missile Division's General Schriever mentioned that a Titan or Atlas is far from the last word.

Design competition for a new generation of missile designs will be invited within the next six months. He also said that the "Minute Man" program will bring additional spending—but not immediately.

Asked about the Air Force's policy on granting more prime contracts to "joint contractor" groups of small companies, the General said that in his opinion management problems made this method of contracting impractical. Too many bases must be touched in coordinating a project or in expediting completion dates. Nevertheless, the General pointed out, present USAF contracts provide, in effect, the same purpose by requiring prime contractors to sub-contract a sizable portion of their work. But experienced centralized management is essential.

Martin gets the "Pershing"...

A $20-million contract for Army's newest entry in the missile field—the 500-mile solid fueled "Pershing"—has been let to The Martin Co.

This is just to get the project started. It will cost several times this amount eventually.

Martin will handle the developing, testing and production of the missile and associated ground equipment. The Army's Ballistic Missile Agency's Ordnance Missile Command, under Maj Gen John B Medaris, will act as watchdog.

The Pershing is Army's bid to shake loose from the 200-mile range limitation that the Department of Defense had placed on Army's missile program.

Army has had its 200-mile range restriction lifted. But it now is confined to developing missiles that can be launched from a vehicle.

The Pershing, which will replace the present Redstone missile, is expected to have a range of over 500 miles. But because it is solid fueled, it will not be as big and cumbersome as the liquid-fueled Redstone.

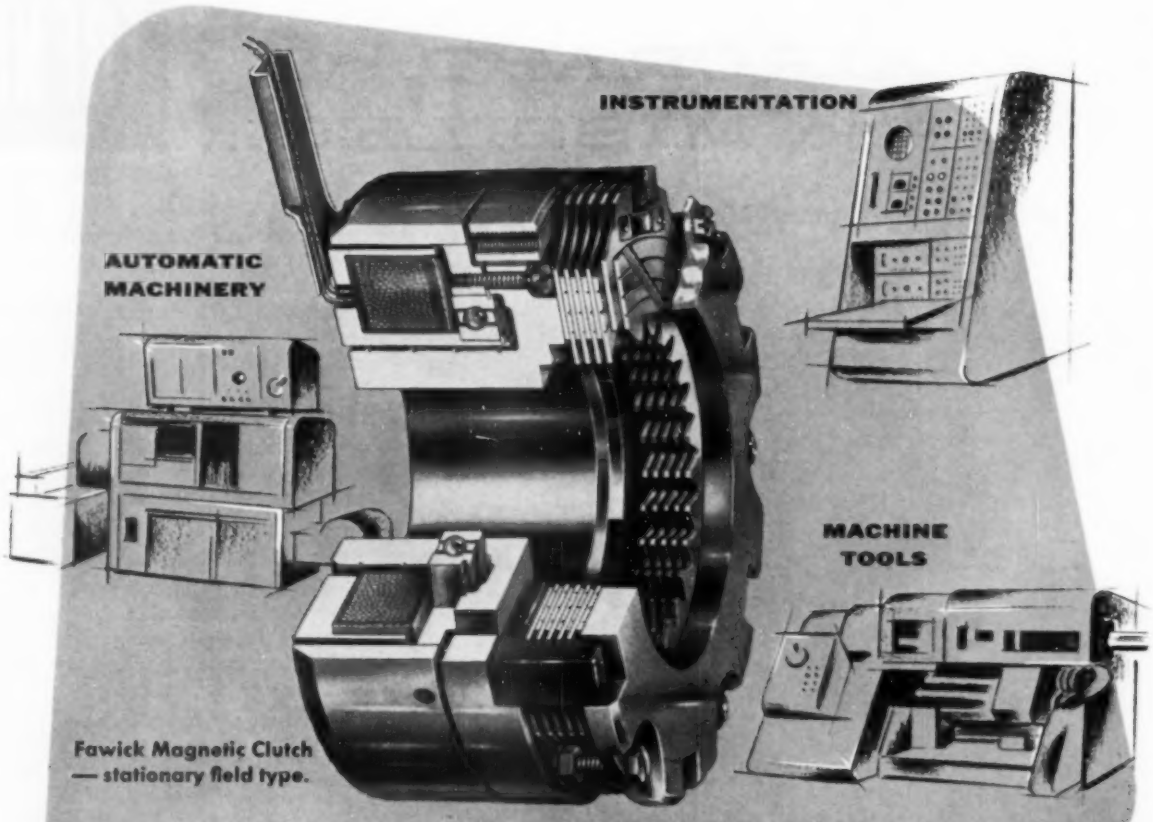
"Exotic"-fuel engines...

Navy will let contracts soon for developing airplane engines to burn the new chemical or "exotic" fuels. What Navy wants is to get an engine that can use either conventional jet fuels or the chemical fuels.

The chemical fuels, primarily boron-hydride based, reportedly give up to 40% higher thrusts than conventional fuels.

Basically, they are range extenders—allow planes to fly farther on the same amount of fuel. They will be used primarily for such things as bombing missions, allowing the planes to penetrate deeper into enemy territory from long range bases. The idea is to use conventional fuel for routine operation, then shift over to expensive chemical fuels for special flights.

Recently, Air Force contracted with North American to build the first chemical bomber—the B-70. Navy isn't this far along, but its first chemical fuel producing plant—at Lawrence, Kansas—will be turning out small quantities of the fuel by May.



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MACHINE TOOLS...

Net orders rising...

Net new orders for metal-cutting type machine tools rose in February to $22.8 million from $19.3 million in January, the second consecutive month in which an increase occurred. March is believed to have shown a further gain.

With inquiries livelier than in some time, there is reason to think that December was the low point for new orders. No sudden sharp rise is expected in business, however. Builders feel that there will be a slow but steady upward movement in the order curve this year, with each succeeding quarter better than the previous one.

Best guess just now is that net new orders for cutting-type machine tools for the calendar year 1958 will be within a range of $350-$400 million. This prediction is based on the assumption that the volume later in the year will be considerably larger than the current rate. Even so, the total would be substantially under the $519 million figure attained last year.

Orders for forming-type machine tools totaled $5.4 million in February. This represents a sizable drop from $7.5 million in January.

Hartford to make components...

Hartford Special Machinery Co is abandoning manufacture of special machines in favor of producing components or building blocks for machine tools.

It will make a broad line of components—automatic drilling and tapping units, way-type feed units, machine bases, columns, adapters, indexing and transfer mechanisms—for machine tool builders and other metalworking companies.

Only exception to the new policy will be for Hartford to build single-purpose machines for specialized applications in which highly-automated equipment is impractical. For details, see p88.

Timken spends $3 million...

Timken Roller Bearing Co is spending more than $3 million to modernize its cup and cone grinding departments at its Canton and Columbus, Ohio, bearing plants and for major equipment for its Bucyrus, Ohio, bearing plant.

117 machines have been ordered from Cincinnati Milling Machine Co and Heald Machine Co. They include cup and cone grinders, cone honers and cup air gages. Modern mechanical loading, shoe-type centerless grinding, and electronic gages and controls will make possible extreme grinding accuracy in Timken's grinding departments, which the company reports will be the most up-to-date in the world.

Deliveries of the new machines are scheduled for late 1958, with pilot equipment to arrive in Canton for testing during the summer.

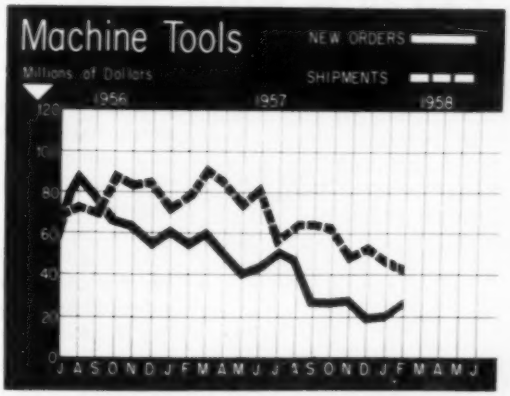
Schools to get surplus tools...

An organized program for getting surplus government machine tools into the hands of vocational schools and colleges is under way, with the Metalworking Equipment Division of the Business and Defense Services Administration, Department of Commerce, as the Washington focal point.

Some 5000 to 10,000 surplus machines may become available to schools during the next three years. One of the main problems is to acquaint school authorities with the availability of the tools and how to go about getting them. State and government agencies will be used.

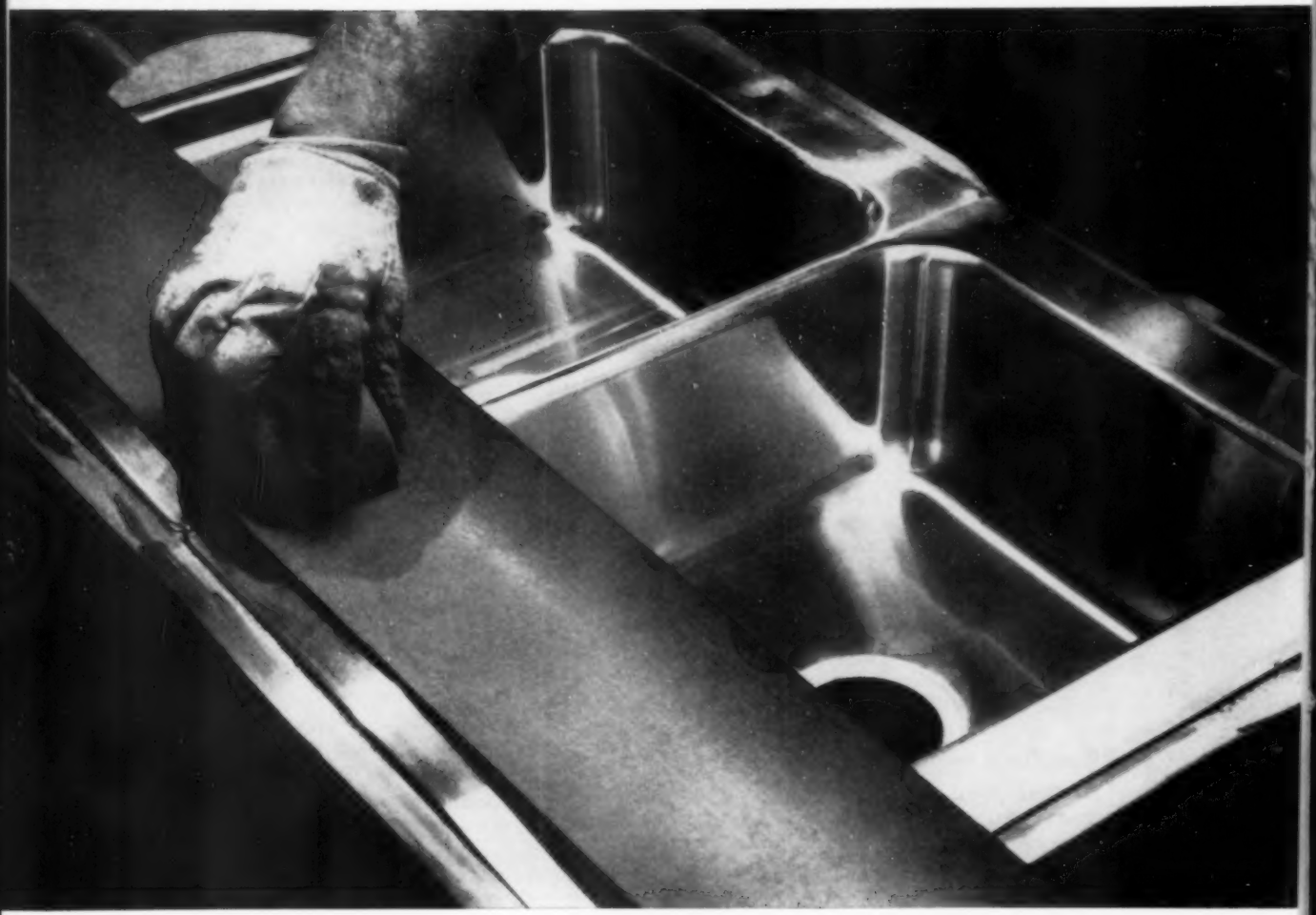
Interested schools should contact BDSA in Washington or inquire through appropriate State departments to which title to the machines may be transferred. BDSA will offer technical guidance to the schools and will help expedite acquisition of the surplus machines.

Some Washington officials point out that installation of thousands of machines in schools from coast to coast is excellent from the standpoint of dispersal for use in a post-attack production period in wartime.



New orders for metalforming and metal-cutting machine tools rose again in February to $28.5 million from January's $26.8 million, but shipments dropped during the same period from $57.8 million to $47.9 million on the National Machine Tool Builders' Association index

* Stainless Steel
polishing information:



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Use light pressure on the polishing agent, and remember that you can't get a desired finish any faster just because you press harder. Take your time. This is by way of saying that Stainless Steel isn't difficult to fabricate, it's just different.

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United States Steel Export Company

USS **United States Steel**

MATERIALS...

To beat the heat...

Operating temperatures for aircraft and missile materials, during the next ten years, will reach 2500 F for a few minutes and 4000 F for a few seconds (today's steels melt at 2500 F), according to a survey by the Aircraft Research and Testing Committee and Manufacturing Committee of AIA.

Development efforts in the next five years should be directed, the committees urged, toward improvement in working air-hardening stainless and alloy steels, such as 5%-chrome hot-work die steels and heat-treatable "straight chrome" stainless. Improvement of sandwich and other panel construction is also necessary. In addition, special liquid propellants for missiles will require structural and mechanical materials having good low-temperature properties down to –450 F.

For the 10-year pull, beryllium, molybdenum niobium, chromium, vanadium, and tantalum, and their alloys, must become usable as commercial materials in the 4000 F range. Investigation of composite materials such as glass-reinforced metals, waffle structures, and cermets (combinations of ceramics and metals) is also required.

High-temperature glass?

Other material goals specified by the AIA joint committee include: transparent plastic to resist nuclear radiation and 700 F; glass materials usable—within five years—at 1200 F and at 2500 F in 10 years; adhesives possessing shear strength of 2000 psi at 600 F for 200 hr soon and at 1200 F within 10 years; sealants, rubber, elastomeric polymers, coatings, insulation materials, oils, greases, and hydraulic fluids must be improved to withstand these high temperatures as well as the effects of corrosion and nuclear radiation. One major problem is found in joining these dissimilar materials.

Beyond new temperature-resistant materials, research is underway to reduce the temperature problem. One such hope is electromagnetic refrigeration. Another possibility is ionization of boundary-layer air to reduce skin friction by providing a blanket of trapped air between the skin and the atmosphere.

High-density polyethylene...

Thoroughly pre-tested, with close to 1,000,000 lbs of pilot-plant production, high-density polyethylene is commercially available from Bakelite Co, a division of Union Carbide Corp. One plant, at Institute, W Va, with a capacity of 30-million lbs annually, is in production. Another plant at Seadrift, Texas, having a capacity of 25-million lbs annually, will be in production within six months. The Institute plant uses the Ziegler process, while the Seadrift plant will use the Phillips process.

Many new properties...

High-density polyethylene cannot be properly compared with the earlier form. Its linear molecular structure provides thin-wall stiffness, low permeability, high service temperature, freedom from distortion at high temperatures (it can be boiled), impact resistance, high gloss and colorability, good abrasion resistance (for sheathing), and good thin-wall electrical insulation properties.

Senators want material relief...

Mining-state senators are, again, pushing hard for increased government support of domestic metals and minerals. Efforts are aimed at increased tariff protection, incentive purchases, production bonuses, tax benefits, increased stockpiling, etc. Unless the Administration's attitude is changed by the business slump, these programs are not expected to go very far. Interior officials say their new incentive package won't contain more than a few "crumbs."

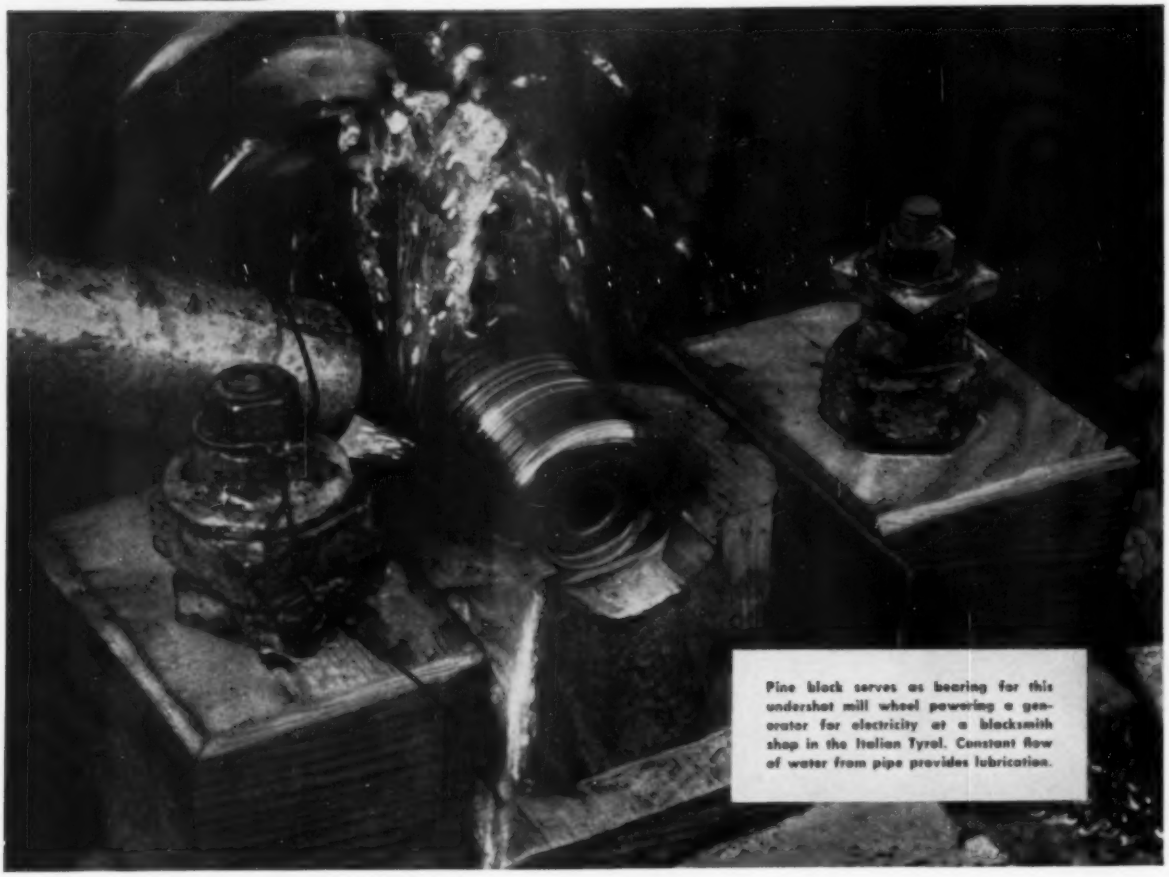
Computer for customer service...

From its new central computer section in Pittsburgh, Crucible Steel Co keeps an inventory of all warehoused items by location. Any warehouse in the country can literally ask a customer to hold the 'phone, then feed in a request by teletype, and within two or three minutes have a rundown on where the nearest required quantity and type of steel is available. Stock lists, which formerly required four days to prepare, are now completed in two hours. The system is particularly helpful to customers in the areas supplied from smaller warehouses.

Low-cost wheel bearings...

have been developed by Timken for Europe's small cars. They will fill any possible wheel bearing requirement for the same type of car that may be built in this country, Timken says. The two bearings (1.98 and 1.57 in. dia) can be used for boat trailers, farm machinery, and conveyors, as well as in special designs.

ND FACTS



Pine block serves as bearing for this undershot mill wheel powering a generator for electricity at a blacksmith shop in the Italian Tyrol. Constant flow of water from pipe provides lubrication.

Is pillow block inefficiency costing your plant money?

The need for relubrication of pillow blocks is *more* than costly today! It's *passé*. For New Departure's new pillow block line is built around the performance-proved Type AE adapter ball bearing with *Sentri-Seals*. Dirt, moisture and wear are sealed *out* . . . grease is sealed *in* — *for life!* Send for details about New Departure pillow blocks. Ask today for Catalog PBC-A.

These bearings are quickly and easily applied to shafting without special tools. They are positively locked in position with eccentric cam locking collar and set screw.

1908–1958 GM FORWARD FROM FIFTY

ND NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

WHAT'S AHEAD... in Metalworking

TRENDS

Output at 84% of peacetime peak...

There is little spring in 1958 Spring metalworking production. The output curve still is heading slowly down and probably will not halt for a while. Normally Metalworking gets solid support from the automobile industry at this time of year, but this year is an exception.

American Machinist's Production Index is estimated at 150 for March (1947-1949=100). That is a drop of 9 points since January and of 30 points in the past year.

This is not as bad as it may seem at first glance. Production volume is now at about 84% of the peacetime peak. That is a long way off from depression levels.

Aircraft and missiles are the only area in Metalworking that appear to be picking up in actual physical output of goods. The gain is not big, but is solid. It should continue as the year goes on. The total still is down somewhat however from the figure a year ago.

Steel demand stays low...

Desultory demand for steel is as good an indication as any that Metalworking this summer is not going to set any records. Steel mills are writing off Detroit as the source of any improvement the next few months.

Steel warehouses have close to a 9-months' supply at today's sales rates (7½ months in sheet, 9 in stainless, 10 in cold bars, 15 in some alloys).

For the first time in several years there is a full stock of all kinds of steel, including heavy plate and structurals.

Customers are letting mills and warehouses carry their steel for them. Number of orders is about the same as it has been, but not size.

Both steel mills and gray iron foundries are looking to the road-building program as a prop. Increased road-building activity is expected this summer.

Farm equipment sales good...

Farm equipment people are among the most optimistic in the metalworking field. While they do not look for an upsurge in sales, they believe that demand this year will be good. At least one maker reports business better than last year. Trend is toward larger and more powerful farm tractors and implements.

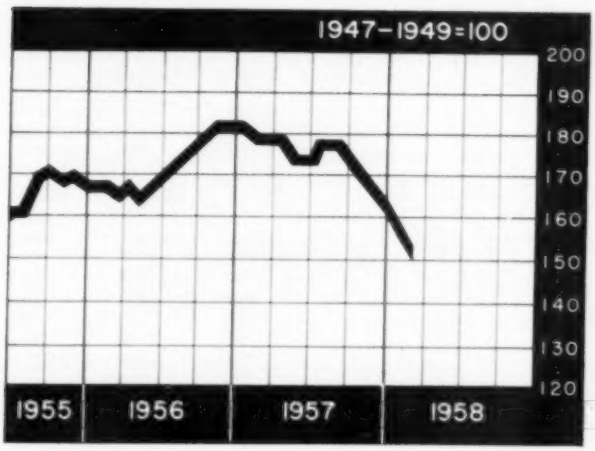
Though home appliance sales are trailing the 1957 volume, manufacturers are making extra efforts to stimulate business. One company is starting a campaign to sell appliances on these terms: no money down on trade-in sales, nothing to pay until July, low weekly payments, payment deferred a full quarter if purchaser loses job or becomes ill.

TV set makers have done better this year than last, with sales up 12% and distributors' stocks down 10%.

Gear sales recently have been up and material handling equipment orders down. The material handling industry, however, is more than holding its own compared with other metalworking industries.

Contract tool and die shops have been doing a little better than they were, with orders rising, but recent shipments are off sharply from 1957.

Placing of tooling for 1959 cars has been partly responsible for improvement. East and west coast shops seem to be doing better than those in the Middle West.



150

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

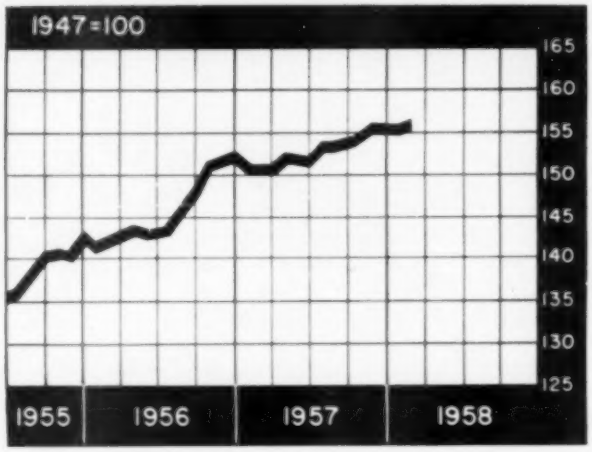
	MAR. Estimated	FEB. Preliminary	JAN. Revised	FEB. Year Ago
Total Index	**150**	**153**	**159**	**180**
Machinery	127	132	154	
Electrical Machinery	179	192	205	
Autos	108	120	140	
Other Transportation	323	318	366	
Other Metalworking	129	135	144	

TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR. Estimated	FEB. Preliminary	JAN. Revised	FEB. Year Ago
Total Index	**155.7**	**155.9**	**156.2**	**151.5**
Metalworking Machinery		**182.7**	**183.0**	**174.9**
Other Machinery exc. Electrical		**165.9**	**166.6**	**160.0**
Electrical Machinery		**157.2**	**157.2**	**153.1**
Fabricated Metal Products		**146.6**	**146.7**	**143.3**



Soft goods output high as durables drop...

The recession, though seven months old, has been confined almost entirely to durable goods manufacturing. Total non-agricultural employment in February was 1.7 million below the August peak of 52.8 million. But note that of the 1.7 million, 1.2 million were manufacturing workers, 83% of them in hard goods.

A key question over the next few months is whether the rest of the economy can remain insulated from the decline in manufacturing, which probably will not turn upward until the last quarter. It's a good bet the answer is yes. Here are some key reasons why:

- **About half the workforce** is employed in services—government, retail and wholesale trade, etc—where employment is far less sensitive to jiggles in the business cycle than it is in goods production.
- **Social security payments** remain at a high level regardless of business conditions. In 1957 public assistance and insurance payments—not counting jobless pay—amounted to about $15 billion.
- **Unemployment compensation** likewise puts a floor under income. About 2/3 of the workforce is covered by such insurance and the average weekly payment of roughly $30 comes to about 40% of the average worker's take-home pay.
- **Automatic wage hikes** are providing another anti-cyclical boon to buying power.

What these points boil down to is this: purchasing power remains high. So, while consumers, whose spending accounts for two-thirds of gross national product, may not be buying many cars and big appliances, they continue to buy a lot of everything else.

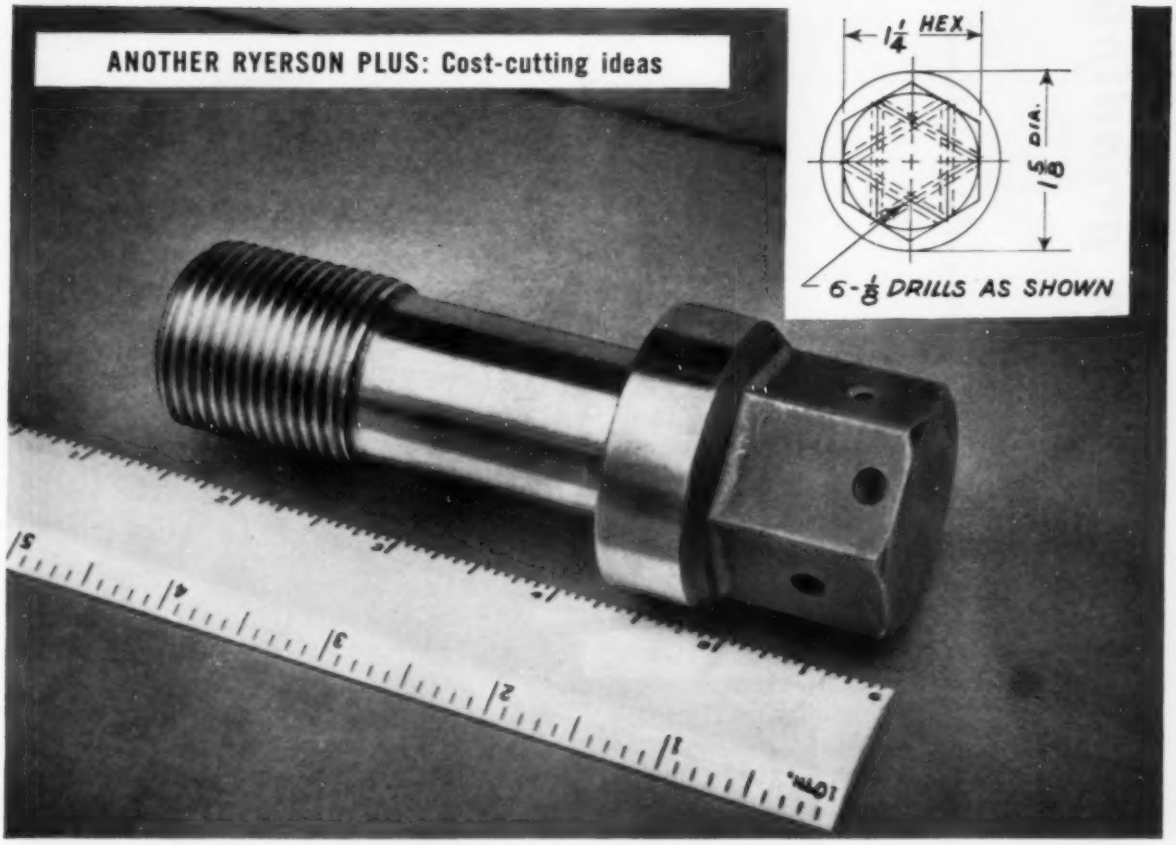
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	125.3	125.8	148.2
Steel ingot production (thousand tons)	1,363	1,417	2,364
Electric power output (million Killowatt hours)	11,756	11,860	11,723
Production of automobiles and trucks	107,731	111,772	172,708
Engineering construction awards (Eng. News-Record, millions)	$441.2	$278.3	$359.0

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	200	220	247
Vacuum cleaners sales (thousands of units)	238	251	281
Washers sales (thousands of units)	207	260	298
Household electric ranges sales (thousands of units)	64	68	114
Radio production (thousands of units)	1,794	1,689	1,715
Television production (thousands of units)	574	575	627
Gear sales index (1947-49=100)	150.8	165.3	235.7
Foundry equipment new orders index (shipments, 1947-49=100)	61.4	59.6	115.6

* Seasonally adjusted



Rycut 40 drills cleanly, cuts down on tool wear and breakage.

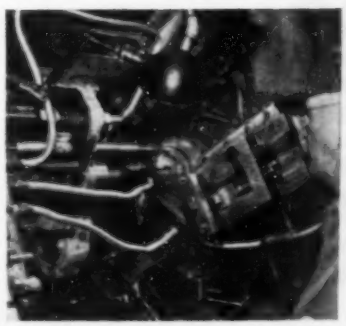
Rycut 40 alloy steel boosts production 30%, tool life 50%

Drilling piston pin bolt heads of AISI 4140 was a costly problem at Hyland Machine Co., Dayton, Ohio.

The job called for cross-drilling two holes in each face of the hex head (see diagram). A Ryerson specialist recommended new Rycut 40, the world's fastest machining alloy steel in its carbon range.

Here are the results, from Partner Forest Hyland: "We have cut down drill breakage. We have 15% fewer rejections. There is a marked improvement in finish, plus a comparable saving shown in milling the head of the bolt. Tool life on the automatic screw machines is 50% longer, total production is up 30%. Now we can produce this bolt at a competitive price."

There is a dependable, cost-cutting steel at Ryerson to meet every requirement. The Ryerson quality controls assure you of getting steel you can count on for dependable performance—every time. Ask your Ryerson specialist for help on your steel problems.



Six-spindle automatic screw machine producing piston pin bolts with cost-cutting Rycut 40.

RYERSON STEEL

Member of the INLAND Steel Family

Principal Products: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK · BOSTON · WALLINGFORD, CONN. · PHILADELPHIA · CHARLOTTE · CINCINNATI · CLEVELAND DETROIT · PITTSBURGH · BUFFALO · INDIANAPOLIS · CHICAGO · MILWAUKEE · ST. LOUIS · LOS ANGELES · SAN FRANCISCO · SPOKANE · SEATTLE

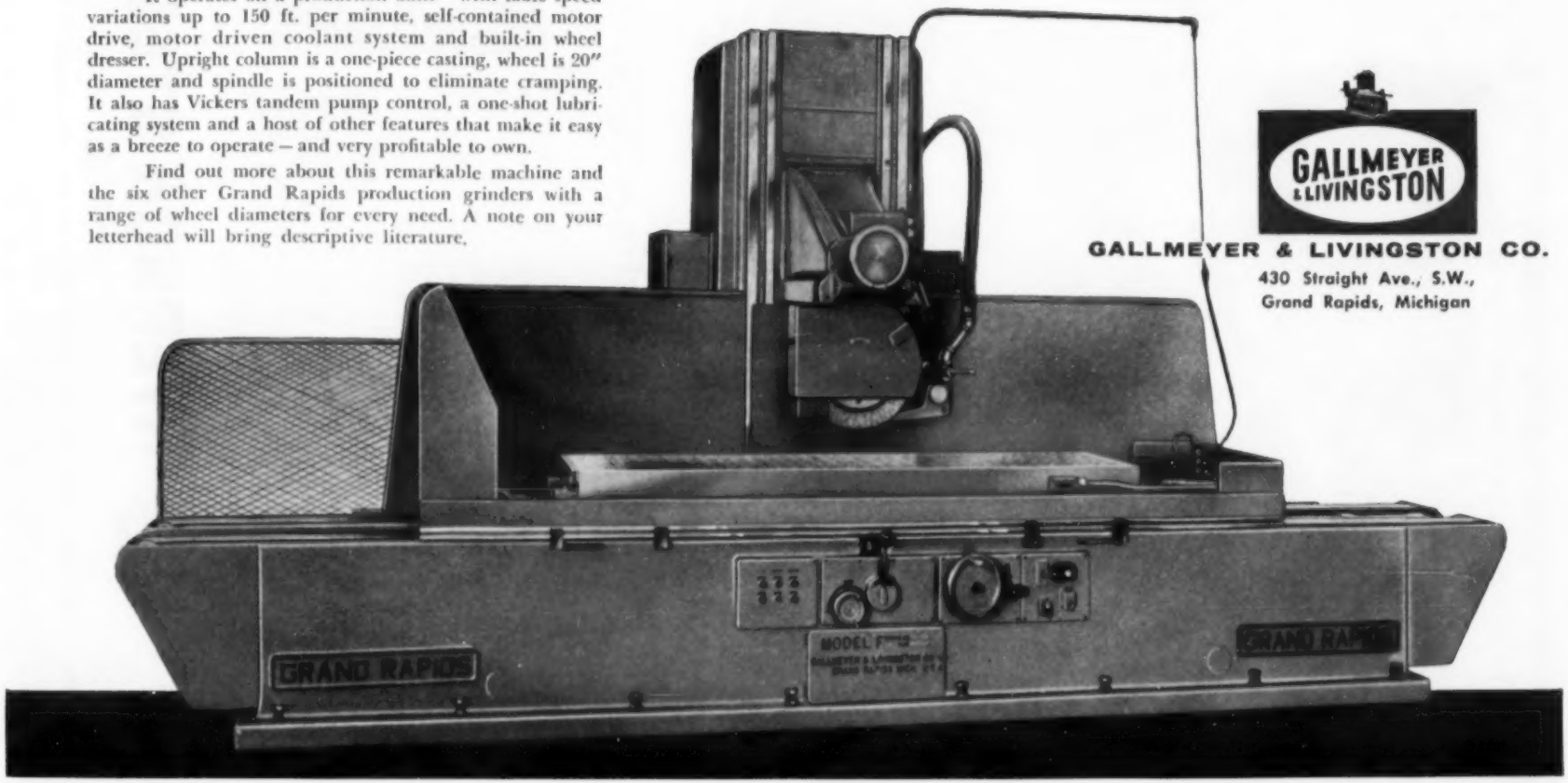
GRAND RAPIDS *accuracy for production grinding*

Now high speed, big surface production grinding can enjoy the same Grand Rapids accuracy that's always been a "must" for the toolroom. The Grand Rapids Model F Production Type Hydraulic Feed Surface Grinder offers the same micro-metric precision that has made Grand Rapids famous for accuracy everywhere.

It operates on a production basis – with table speed variations up to 150 ft. per minute, self-contained motor drive, motor driven coolant system and built-in wheel dresser. Upright column is a one-piece casting, wheel is 20" diameter and spindle is positioned to eliminate cramping. It also has Vickers tandem pump control, a one-shot lubricating system and a host of other features that make it easy as a breeze to operate – and very profitable to own.

Find out more about this remarkable machine and the six other Grand Rapids production grinders with a range of wheel diameters for every need. A note on your letterhead will bring descriptive literature.

Grand Rapids Model F Surface Grinder accurately grinds big surfaces at unsurpassed speeds



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GALLMEYER & LIVINGSTON CO.
430 Straight Ave., S.W.,
Grand Rapids, Michigan

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Like Finding New Capital

Sitting on its hands has assumed all the popularity of a parlor game with metalworking management. While it takes on this posture, no commitments for purchase of capital goods are made.

It tends to look upon production equipment as a "postponable item." If we don't buy it now, two months from today is just as good a time. What's the hurry?

Well, the answer might be, "Sir, there is more urgency than you think." Then, you might toss in a disconcerting question like this one: "Would you be willing to spend some money now if it cut down the amount of working capital needed in your business?"

This is not a "pie-in-the-sky" question, but strictly a down-to-earth one. For facts exist to prove that the answer should be a hearty "yes."

Take the case of...

an eastern metalworking company. It purchased single-purpose drilling and tapping machines for working on the base casting of its product. The prime purpose of installing the new machines was to secure cost reduction, plus speed and accuracy of manufacture.

There was a very important by-product, however. Previous to the new installation some 500 castings had been in process, from the foundry door to the shipping platform. To its delight, the management found that it was able to maintain its production schedule and deliveries, using the new machines, with a total inventory of only 80 castings.

The reduced amount of stock required was like finding working capital. It released a substantial cash investment that more than offset the capital paid out for the new machines.

The experience of a midwest manufacturer even more vividly illustrates the same point. This company had been carrying in stock $125,000 of tools which needed only a small amount of work done on them before being shipped to customers. The management lived in constant fear of obsoleting one day a large portion of this inventory by a major design change.

By investing $30,000...

in certain single-purpose machine tools, the company was able to take rough blanks and within hours produce finished tools. It discovered that it could maintain deliveries even better than before and at the same time cut its inventories to a negligible figure. What it did was to return $95,000 of working capital to the business to be used for other purposes, while minimizing the possibility of obsoleting any sizable volume of tools.

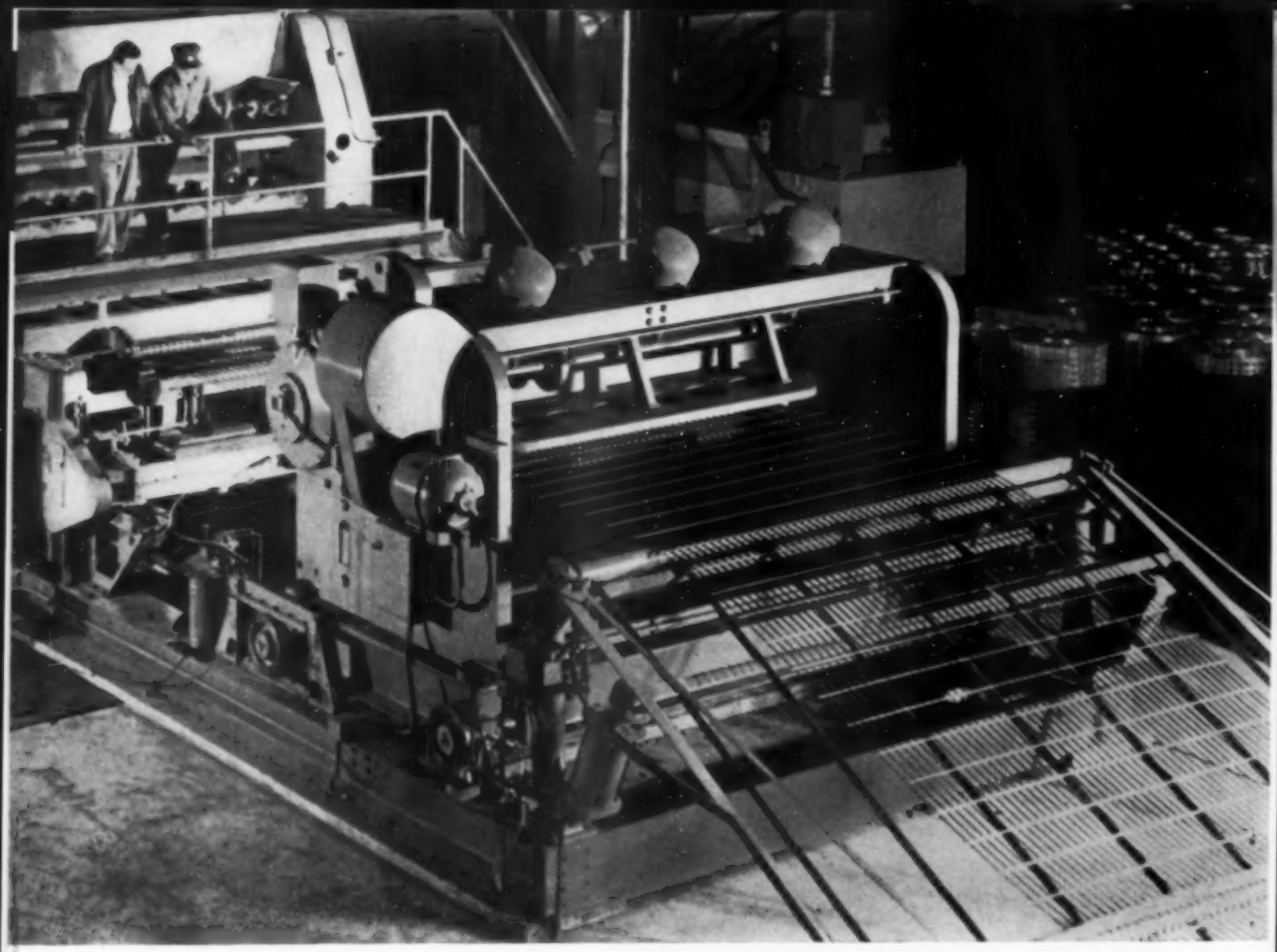
Here are two cases in which modest investments in new machine tools paid off handsomely —far beyond management's hopes. The most beneficial results were not the traditional direct cost-savings. They went far beyond that to release precious capital for use in building the company business in other directions.

Not by the farthest stretch...

of the imagination can these cases—or other cases like them—be called "postponable items." They have a compelling urgency about them that should make managements abandon their do-nothing policy.

What could have a greater claim for quick and decisive action than an investment that pays a 100% dividend immediately? Even the shrewdest Wall Street broker could not suggest a better and surer bet.

Burnham Finney EDITOR



Cincinnati Shear cuts wire mesh at Pittsburgh Steel

The Cincinnati Shear shown is part of an automatic wire welding machine at Pittsburgh Steel Company, Monessen, Pennsylvania. The machine produces wire mesh and fabric used for concrete pipe, buildings, and other applications. The photograph shows the shear cutting forty-seven 2/0 gauge (.331″) wires per stroke. The wire is low carbon, cold drawn steel. Other jobs require shearing mesh with wires up to ½″ diameter. This shear was specially engineered for this type of application. Because cuts are heavy and production is continuous, Cincinnati dependability is essential.

Standard Cincinnati Shears offer such productive features as powerful hydraulic hold-downs, all-steel interlocked construction, and one-clearance shearing of different metal thicknesses.

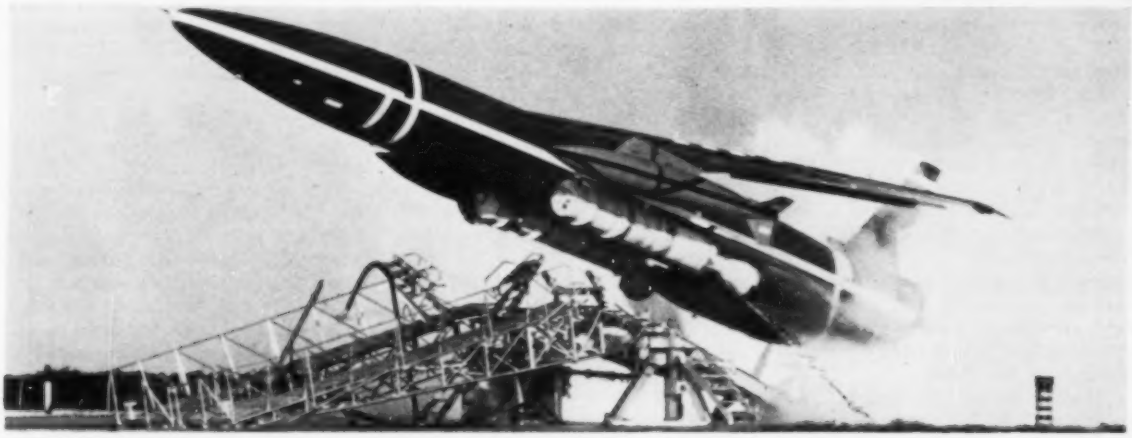
Write Department A for Shear Catalog S-7R.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio

NEWS REPORT...



AID FORCE'S SNARK missile had its premier West Coast showing during the Western Space Age Conference—first in a series of nationwide appearances to be made by the display missile this year

"The Air Force/industry complex has the capacity to convert any technological breakthrough into operational hardware."
— US planemakers talk over how, when and . . .

What's ahead in missile output?

LOS ANGELES—Biggest array of missiles and missile experts ever assembled in this country met here March 20-22 to talk shop at the invitation of the Los Angeles Chamber of Commerce. Their purpose: to acquaint the area's aircraft primes and subs with the production and contracting problems that the switchover from manned aircraft to missiles brings with it.

On hand for the Western Space Age Conference were some 15,000 people vitally connected with the missile industry—military experts, scientists, primes and subs. On display were the exhibits of 50 primes and some 400 subcontractors in Shrine Exposition Hall—plus models of the Explorer and Vanguard satellites. Making its public debut at the show, too, was Northrop's 6000-mile-range Snark.

Top Experts on Hand

Roster of speakers read like a "Who's Who" of missiledom: Dr Wernher Von Braun, director of development, Operations Division, Army Ballistic Missile Agency, Huntsville, Ala; Dr William Pickering, director, Jet Propulsion Laboratory; Lieut General Clarence S Irvine, deputy chief of staff for materiel, USAF; Dr Lee DuBridge, president of CalTech; Rear Admiral Jack P Monroe, commander of the Naval Air Missile Test Center, Point Mugu, Calif; and Courtland S Gross, president of Lockheed Aircraft.

"If the government follows the plan of assigning air companies the dominant role in missiles, the supporting industries will continue to grow," Lockheed's president Gross told the Conference, "but if the supporting industry is given the dominant role, the air companies will have to ally themselves—whether by absorption, merger, partnership, or other means—in such a way that the volume of business available to them will be adequate to keep them thriving and growing."

Mr Gross pointed out, too, that since World War II's end inexperienced, non-aircraft firms have been given primary responsibility for weapons systems in many cases. If the government intends the major aircraft companies to stay in the aircraft business, Mr Gross said, it ought to give "serious consideration to confining weapons system responsibility to the air companies."

Otherwise, the air companies will have to seek business in such fields as propulsion and electronics, and in other areas in which they have not as yet penetrated deeply.

Lockheed's president went on to point out that the percentage of the cost of a plane attributable to the airframe is dwindling. Biggest part of the cost today goes for power plant, guidance systems, electronics gear and the like.

The West Coast has a particular stake in the missile business, Mr Gross said, citing the Defense Dept's six super-priority-missile-satellite programs, of which California companies have prime contracts on four. Douglas, for instance, had 27% of its 1957 sales in missiles. Northrop's backlog is 57% guided missiles, and Lockheed expects 25% of its 1958 business to be in missiles. North American, Convair, Hughes and Aerojet General are heavily involved, too. Of the nation's 43 missiles of all types, West Coast firms are involved in 25, are primes on 14.

Supplier Network Is Huge

Lieut General C S Irvine told the gathering that the "Air Force/industry complex" has the capacity to convert any technological breakthrough into operational hardware," pointing out that 17 primes, 200 major subs and some 200,000 suppliers are tied in with missile output.

Biggest challenges are development of (1) vastly improved sub-

systems, (2) engines that can deliver even more thrust-per-pound than the 1-million-lb project initiated last year, and (3) vastly improved electronics systems. Most immediate problems, the General said, are achieving better quality control and reliability than ever before in aviation history.

Today, General Irvine said, weapons systems are almost obsolete before they are even introduced into operational units, and "This means that we are moving into and out of new systems at such a rapid pace that long production runs are out of kilter with the times.

"Manufacturers," he added, "must recognize this fact and plan their production schedules accordingly. We don't want, and can't afford, the luxury of buying excessive quantities of any particular system."

Design Will Be All-Important

The diversified needs of the years ahead will not depend so much upon mass production capabilities as upon forward-looking design, engineering and production techniques, according to General Irvine, who added that "a relatively unknown company today could be the major space vehicle contractor of tomorrow."

At a technical session on "Tooling for Missiles," William L Young, Convair Astronautics operations manager, reported that his firm spends 70% of all its dollars on procurement, 30% on work it does itself, and this is a typical case, he thinks.

"However," Mr Young said, "the old time procurement system of just buying nuts and bolts from people is on its way out. What we're buying today is development."

Mr Young went on to predict that the run-of-the-mill shop will pass into oblivion, that the companies which will thrive will be those that can turn out high-quality, high-precision specialized items. And more and more, he added, small specialized companies will be called upon to design, build and test their own products—"There's so much we can't do ourselves, we look for people to come to us and tell us what they can do."

Success in the tool business will depend strictly upon conformity with the print, it was brought out in the session—even if demands of design engineers and scientists sometimes seem impossible, or at best unreasonable.

A code for primes and subs who want to get a fair piece of the nation's missile business was outlined by Bendix Aviation's David H Brown. Among the "musts":

- Encouragement of engineering of new designs.
- Improved engineering and manufacturing techniques.
- Mutual understanding of each other's problems by the tooling engineer and the design engineer.
- Treatment of tooling as a single, continuous process.
- Complete analysis of tolerances by engineers before turning them over to tooling people—"changes have to be made on the drawing board—not when you're cutting chips."
- Remember that "tools not made to print are not good enough" in this age of close tolerances.

Talking about the equipment that will be needed to make missiles, Lockheed Missile Systems Division's Tom Vajda said that general purpose machines will be most in demand, but they will have to be far more accurate than the ones so far available. Demand is also growing, he said, for better numerical control equipment, and for special-purpose tools.

Separate Space Projects?

At the Conference dinner session attended by more than 2000 people, Dr Von Braun said that if America's attempts to put a man into space continue to be tied in with a ballistic missile program, Russia will beat us to the punch.

What we need, Dr Von Braun said, is a big rocket engine capable of powering a manned orbital rocket "even if that orbital rocket does not qualify as an integrated weapons system, and is nothing more than a glorified test bed."

"The big question today," Dr Von Braun concluded, "is not how to enter space—but simply whether we commit the resources necessary to the undertaking."

Offer $2000 in Prizes for Resistance Welding Ideas

PHILADELPHIA — Prizes worth $2000 in all will be awarded by the Resistance Welder Manufacturers' Association this year for the best papers on resistance welding. First prize is $600, second $300, and third $100 in each of two classifications—Special Projection Welding and General Resistance Welding. Acceptable are papers dealing with "educational and informative categories of welding production, machinery design and fabrication, automation and welding mechanization."

Contest is open to men in industry, students and instructors. Manuscripts (minimum: 2500 words) must be received by RWMA, 1900 Arch St, Philadelphia, no later than September 15, 1958. Photos, charts and the like may either be attached directly to the copy, or sent in separately.

Accuracies to Millionths Demonstrated by Sheffield

DAYTON, OHIO — High-precision machine tools and gages for making missile components to accuracies of millionths of an inch were demonstrated here in a two-day seminar on manufacture and measurement of missile components, sponsored by Sheffield Corp, a division of Bendix Aviation Corp. Aircraft and missile makers from the United States and Canada attended, some 80 in all. The seminar was the first to be held on manufacture, grinding and gaging of hydraulic servo valves.

Millionths in Missiles

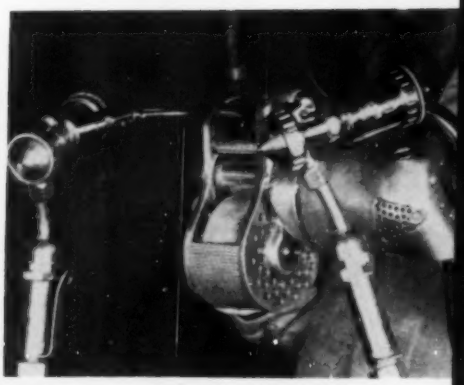
During the seminar, it was stressed that dimensions of many missile components must be held to millionths to insure instantaneous actuation of controls.

The Sheffield "Servo Package," demonstrated during the seminar, includes not only nine grinding machines, but pneumatic, electronic and mechanical gages and inspection equipment. Sheffield's ultrasonic Cavitron machine handles finishing of oil ports in cylinders.

20 in a Series

This meeting is something like the 20th of its type held at Sheffield's plant since 1956. More than 250 U S and Canadian firms have sent their people to learn how to cut machining and gaging costs by seeing new techniques in action.

Some of the subjects at previous two-day clinics include air-gage circuit design and tooling, automatic gaging and segregating, automatic assembly machines, machine control gages, thread and form grinding, ultrasonic machining, and planning a gage laboratory.



Spray-up Process . . .
combines plastic, accelerator, catalyst, and glass-fiber through a portable three-barrel spray gun to build up reinforced plastic laminates. Technique holds promise for plastic tooling such as jigs and fixtures

Something new for reinforced plastic structures:

Spray-Up Instead of Lay-Up?

CLEVELAND, OHIO—The time may come when you'll drop into a "do-it-yourself" shop and spray-up your own boat, using one of a choice of molds, or borrow a gun and spray your own swimming pool. Neither of these possibilities is very far out of reach with the new Rand Fiber-Resin Depositor. However, Rand Development Corp intends the equipment for commercial applications.

Already, this spray-up process has proved practical for boat manufacturing, construction of a variety of prototype shapes, motor shrouds, truck bodies, chemical tanks, bath tubs and sinks, shower floors, swimming pools, and mechanical housings.

The new tool is a three-way gun which sprays activated resin and chopped fiber-glass strands simultaneously. It will deposit up to 15 lbs of high-strength laminate per minute, and is designed for operation by one man. Costs of laminating large parts, such as a 14-ft-long boat, are reduced as much as 40%. There is considerable potential for this process in making plastic tooling, such as jigs and fixtures.

Among the important advantages of the process are: large-scale savings in lay-up time, reduced materials costs, and improved physical properties. Similarly, the production technique requires less skill than lay-up and spraying lends itself to automation.

The Rand gun consists of a roving (strands of glass fiber) cutter combined with two resin spray guns mounted together on a single hand-held frame. One spray head carries plastic and accelerator, the other head carries plastic and catalyst. Thus, it is possible to combine the two essential conditions. Resin pot life is retained for up to two days, yet the resin can be fast-setting to permit parts to be made in a matter of minutes.

Outside the gun, in mid-air, the three streams, two of resin and one of glass fibers, meet and laminant is deposited on the mold. Rand claims that a minimum of air, detrimental to structural strength, is trapped in the laminate. Weighing only nine pounds, the gun is readily manipulated. It will deposit fiber and resin, mixed, on any conventional mold construction or surface.

Chops Three Strands at Once

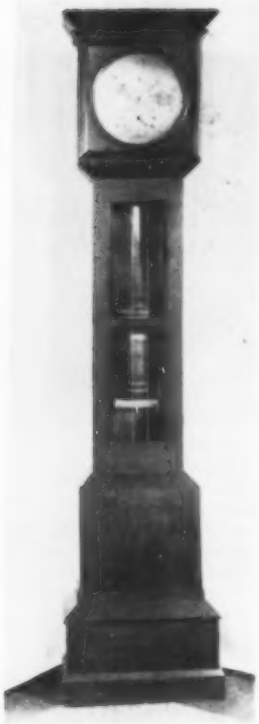
Both continuous and spun roving are acceptable and as many as three strands of roving can be chopped at on time. Lengths of chopped fiber range from $\frac{3}{8}$ to 4 inches. Either continuous or spun roving can be used and the gun is designed to accept commercially available types. A large number of resins, depending upon the part requirements, are usable in the gun.

The gun is powered by 110-volt AC, used with compressed air.

One of the major problems that was overcome in refining the process was cutting roving. The prototype was fitted with six HSS blades costing $2.40 apiece. They cut the roving against a nylon sleeve which was on a spring-loaded roller. These cutters had a disappointingly short life. Now low-cost cutter blades cut hundreds of pounds of roving before they wear out and they are quickly and easily changed when necessary. The answer, simply, was to use "Injector" razor blades against a high-durometer rubber roller.

Laminate, as deposited, is a fluffy resin—a saturated mass which compacts quickly and easily to form the finished laminate. Finishing operations are limited to trimming the molded piece. Raw material costs are cut because roving is used instead of more costly forms of fiber-glass, such as mat or cloth. Savings on roving are 30 to 50%.

Physical properties can be improved as much as 15% over conventional fiber-glass materials as a result of improved wetting and the high glass content obtainable with the gun, which can readily be 40% or higher. An additional advantage is the considerable reduction in wasted fiber-glass and resin. It is estimated that pre-tailoring of fiber-glass for conventional hand lay-up wastes 10% in trimming and fitting. Conventional low-pressure molding techniques such as hand lay-up, vacuum, and matched-die processes are said to waste as high as 15 to 20% of the raw materials. The spray-up process can cut waste to under 5%.



This was Brown & Sharpe back in 1872

Brown & Sharpe

. . . this old clock, built by founder Joseph Brown, has ticked away a century-and-a-quarter of "Progress in Precision" at America's oldest machine tool company . . .

PROVIDENCE, R I—New ideas, new products, new concepts—built onto a rich heritage of industrial pioneering—are the order of the day here as Brown & Sharpe celebrates its 125th anniversary this month.

For "Progress in precision" is still the watchword at Brown & Sharpe, just as it was in 1833, when Yankee pedlar David Brown and his son Joseph set up shop in Providence "to make and repair clocks and watches and do other mechanical work of precision." Proof of that is the Brown-built grandfather clock that is still ticking away the hours in the front office—hours that have seen the company grow from a tiny two-man shop into an industrial giant whose products are and have been a by-word in metalworking for many decades.

Mention, for instance, a B & S "double 0," or a B & S No. 2 to any competent shopman. He doesn't need to be told you're referring to a screw machine or a milling machine. Or look at the roster of top industrialists who have come out of Brown & Sharpe's famous apprentice school.

And B & S has had more than its share of inventive genius in its century-and-a-quarter. First there was Joseph Brown, who began making lathes and small tools for machinists back in 1831, even before his father took him in as a partner in what was to become Brown & Sharpe. Joseph Brown had one unswerving purpose—to raise the standard of accuracy in machine shop operations. And he attained that purpose to such a degree that it is difficult to imagine what metalworking would be like today without his pioneering inventions.

Some B&S "Firsts"

Let's look at just a few of them: the first precision gear-cutting and dividing engine (1855); the first U S-made wire-sizing gages (1858); the first universal milling machine (1861); the first formed cutter 1861); and the first universal grinding machine (1865-75).

Paralleling the genius of Joseph Brown was the business acumen of Lucian Sharpe, who joined Brown as an apprentice in 1848. Under his regime as president the company patented the first automatic screw machine (1890), and introduced unit construction into milling machine design (1901).

Then came Henry D Sharpe, son of Lucian, who for nearly 50 years was to direct the destiny of the fast-expanding company. During this time, B & S continued to improve its machine and tool designs, introduced the Omniversal milling machine (1935) and permanent magnetic chucks (1937).

125 Years Young

New blood and new ideas were infused into the old company with young Henry D Sharpe, Jr, who succeeded his father as president in 1951. With him came the introduction of four brand-new universal grinding machines, the beginning of the biggest replacement and expansion program in the company's history, acquisition of Nelco Tool Co, Manchester, N H, carbide-tool-makers; and Double A Products Co, Manchester, Mich, hydraulic valve makers.

A lot of other things have happened in the last few years, too. The years 1956 and 1957 alone saw introduction of more than 600 new industrial products to the metalworking industry. Along with this came the opening of B & S's "Precision Center," a large display and customer training area in the Providence plant. Then in 1957 a mobile Precision Center went on the road to visit customer plants throughout the country.

And this year, Brown & Sharpe

These are the men...

Joseph R Brown
"No one . . . has done so much for modern high standards of manufacture of interchangeable parts for machines"
—Henry M Leland, pioneer automaker

Lucian Sharpe
September 12, 1848, job book entry: "Lucian Sharpe came to work this day for me as an apprentice" . . . and he stayed on to become president

Henry D Sharpe, Sr
"Industrialist, business executive, educator, philanthropist, student of history, good citizen," he devoted 63 years of his life to B & S

...and the machines that have made B & S a byword...

turns 125

has already created a new Cutting Tool Division, and a Hydraulics Division.

But B & S's impact on metalworking cannot be measured in products alone. Perhaps its finest product of all has been the men it has sent out over the years to fill key positions in metalworking plants across the country.

Credit for this must go to Brown & Sharpe's famous Apprentice School, which since 1888 has graduated so many famous industrialists that it is often called the "Cradle of the Machine Tool Industry."

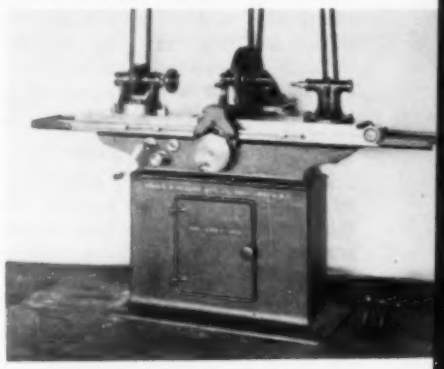
Senator Flanders Salutes B&S

But let the School's most famous living graduate, United States Senator Ralph E Flanders of Vermont, himself onetime president of Jones & Lamson, Springfield, Vt, machine tool builders, tell what Brown & Sharpe's training meant to him.

In an exclusive interview, Senator Flanders (Class of 1900) told *American Machinist:*

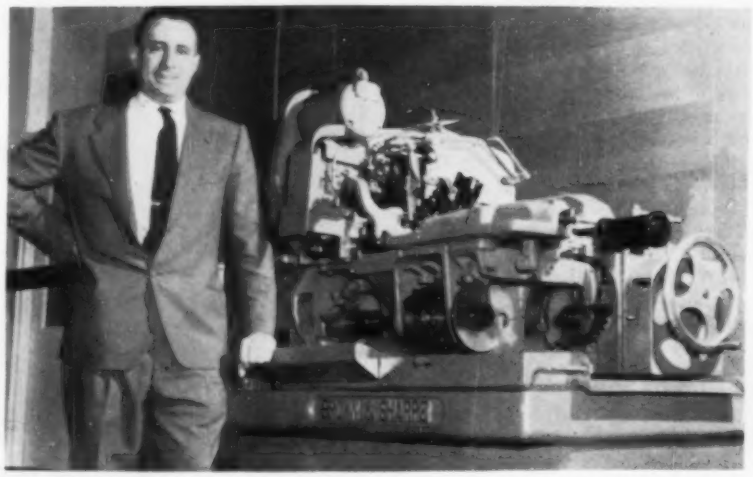
"On January 14, 1897, I entered on an apprenticeship to the machinist trade at Brown & Sharpe. In so doing I became a pupil in the finest school of workmanship that in my experience has ever existed. Precision and responsibility for precision were in the very air we breathed. Where else would it be confidently expected that an apprentice or a

First universal miller (1861)



First universal grinder (1865-75)

Today, young ideas for an old firm . . .



Henry D Sharpe, Jr, B & S president since 1951, has brought a fresh young outlook to the company's rich tradition. Here he is pictured with B & S's newest, streamlined No 2 automatic screw machine

Germany's Schiess Builds Unique Gear-Hobbing Plant

DUSSELDORF, GERMANY — A unique temperature and humidity controlled building, recently completed here by Schiess machine tool works, is claimed by the company to have advanced precision in the manufacture of gear hobbing machines to a remarkable degree. The building's interior (125 x 90 x 40 ft high) is completely temperature controlled to 68 F with a deviation of ± 1 F at a maximum of 55% humidity. And not only is the building air conditioned, three erection foundations are, too.

68 F temperature, 55% humidity . . .
. . . are helping Germany's Schiess AG to turn out gear hobbing machines to accuracies never before achieved by the firm. Gear hobber at rear left machines large precision gears. In right foreground, two hydraulic gear shapers are in process of being assembled

Materials Expand Equally

Entire design of the structure takes into consideration materials that have closely related coefficients of expansion. Roof has several layers of varying types of insulation, and has a false roof between it and the shop. Building can be entered through triple-door airlocks. Parts are held in the second airlock until they reach 68 F.

Special Ducting Throughout

In addition to machine tools needed to manufacture gear hobbers, the building is equipped with a 25-ton crane. No ducting or pipe work is visible. Air suction channels in the floor allow motors to be shrouded during test runs so that heat can be transferred directly out of the plant.

During final test runs on a gear hobber, automatic units record temperatures to within 1 F, so that test results can be correlated with the building's temperature and humidity at time of test.

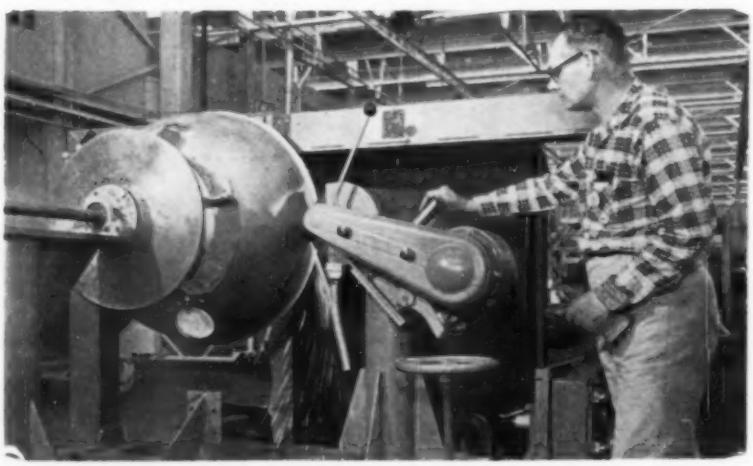
The Schiess people believe that this is the first building of its kind in the world designed for the manufacture of large machinery. The extra cost and outlay involved in controlling humidity and temperature to such a degree, they say, have more than paid for themselves in the much closer tolerances achieved by machining and assembly within the new building.

Stainless Gets the Nod for Spaceship Building

NEW YORK—Stainless steel is the primary metal in America's new outer space experimental research craft, now under development by North American Aviation, and scheduled to fly in 1959. The X-15 rocket plane is designed to carry man at 3600 mph at 100 mile altitudes.

To achieve this, the craft must reach Mach 4 (2720 mph above 35,000 ft) inside the earth's atmosphere. This means skin temperatures of 1000 F, at which conventional aircraft metals lose most of their strength. Stainless was selected by the craft's designers as the most durable material under these conditions and the X-15's skin and wings, plus control-carrying protrusions, will all be of that metal.

Fabrication techniques for the X-15 include chemical milling of side panels, both automatic fusion welding and resistance welding, and hydraulic tube brazing.



Trimming X-15's spherical fuel tank . . .
. . . after drawing operation at North American. The fuel tank, like the wings, skin, and other high-stress parts, is of stainless steel, needs to withstand temperatures to 1000 F on leaving and re-entering earth's atmosphere

Brown & Sharpe

workman would report his own mistakes instead of waiting for an inspector to find them?

"Of course we had inspectors, but it was not considered creditable for them to find unreported errors.

"The basis for this accuracy was training in such fundamentals as the care of lathe centers, and of the center holes in turned work. Furthermore, it was accuracy carried to the point where it made a commercially superior machine tool—not just accuracy for its own sake. I do not know whether such training now exists in the world. I am only glad that I was privileged to undergo it."

The "Good Old Days"

The old grads, no matter how high they have risen in industry or how far they have scattered, come back to B & S every few years for a bangup reunion dinner. It's then you hear them talk about the Good Old Days when they were perennially broke but young, happy and fired with ambition.

Take Al Hurst, assistant to B & S Machine Tool Division's vice president and general manager—"When I came here in 1916 we worked 55 hours a week—7 am to 6 pm weekdays, 7 to noon Saturdays. Got 8¢ an hour our first year. So we used to console ourselves that if we did lose a day's pay we only lost 80¢. Not only that, we had to kick in a nickel a week for soap.

"Some of us commuted in from places like Fall River, Mass, and you can imagine how broke we were, what with carfare and lunches. The trick was to court some girl in town. In that way you could usually get yourself invited to Sunday dinner."

Others like Bill Kelm (Class of '35) lived in dormitories under the watchful eye of a house mother and father. Bill had it made. He became the star boarder at his girl's friend's house, which was right next door to the pattern shop. She's Mrs. Kelm now.

A lot of old grads are still with Brown & Sharpe, and a lot of them have moved on to responsible positions in metalworking and other industries, but like Senator Flanders they are to a man proud of the things they learned at Brown & Sharpe.

"Progress in Precision" isn't just a catchy phrase at Brown & Sharpe—today a young 125—it's a way of life.

Building block models and new designs . . .
. . . get a going over from Hartford Special's management committee as the company makes a major product switch. From left: L K Shepard, sales manager machine tool components; E W Smith, Jr, executive VP; Robert P Merritt, president; Paul H Richardson, VP engineering; and Robert A Bode, general sales manager

Hartford takes the plunge, from Specials to Building Blocks

HARTFORD, CONN—"It is paradoxical that the machines used in mass production are not themselves mass produced." With this pholosophy, long-established Hartford Special Machinery Co is pegging its future on what it believes is the coming trend in automation—the highly publicized and controversial "building-block" concept.

Hartford Special this month is de-emphasizing the manufacture of special machines to stress development and components, or building blocks, for machine tools—a bold step for a firm that has long supplied completely assembled automatic machinery to leading metalworking companies.

Hartford will concentrate and intensify its manufacturing, sales and marketing efforts on providing a broad line of components—automatic drilling and tapping units, way-type feed units, machine bases, columns, adapters, indexing and transfer mechanisms—for machine tool builders and metalworking firms.

The Hartford people feel that such a changeover can be accomplished with comparatively minor disruptions in its manufacturing procedures and sales policies. Too, they think that if the company's energies are concentrated upon development and production of components that are in continuous demand, rather than upon large machine tools, sales will present a more consistent pattern.

Since World War II's end, Hartford has pioneered in the "do it yourself" machine tool building concept, has already standardized the components in its automatic machines.

The building-block automation concept received its greatest impetus in 1956, when Ford Motor Co came out in favor of it (*AM*—Jul 16 '56, p113). More recently, in September 1957, Ford presented the case for building blocks to top Pentagon officials. Ford's recommendations: (1) plan for the actual products that would be needed on M-Day, (2) design the machine tool components that would be needed for the job, and (3) build and stockpile those components as soon as possible.

Hartford Special plans to continue making to contract single-purpose machines for specialized applications where highly automated equipment is impractical. However, as Robert Merritt, president, puts it: "We are betting that the concept of building-block automation will be universally adopted in a short time, and we want to be ready."

". . . by spending 25% of our total inventory value on machine tools, fixtures, and processing equipment, we have cut our inventory by nearly 85%. This reduction was achieved by almost completely eliminating setup time for each of the wide variety of parts. Reducing the inventory also permitted immediate improvement in product design without waiting for a long liquidation period, as occurs with big inventories. In addition, deliveries have been stepped up, quality has been improved, and production costs have been drastically reduced."

— C R DeVLIEG, executive vice president, Microbore Div, DeVLIEG MACHINE CO

Fresh Approach to Replacement Turns

• Inventory of 100,000 Microbore tools was slashed an amazing 85%

• 75% of its dollar value was converted into active capital

• Quick delivery of standard and special tools was maintained, even improved.

These desirable and profitable results at Microbore Div, DeVlieg Machine Co, Ferndale, Mich, were made possible by new machine tools, fixtures, and processing equipment installed at a cost of only 25% of the dollar value of the old inventory level. Other direct benefits:

1. Sharp reduction of setup time for the wide variety of parts (threaded toolbit cartridges are produced in 750 variations of grade, size, style, and length).

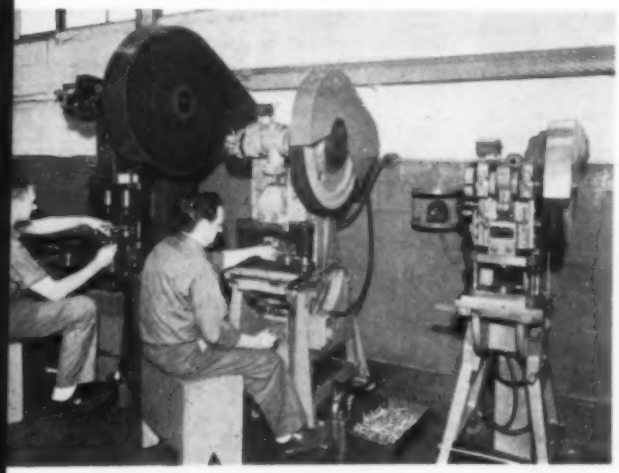
2. Reduced wait for product-design improvement because smaller inventory takes less liquidation time.

3. Improved product quality.

4. Drastic reduction in direct manufacturing costs.

The cash investment that made these advantages possible was quickly recovered as the huge original inventory was whittled down to the present modest level. Newly installed equipment includes a two-stage punch-press setup, 16 special milling machines designed and built by DeVlieg for contouring the toolbits, three induction brazing machines (one with replaceable coils), one extra thread roller, and an extra grinder.

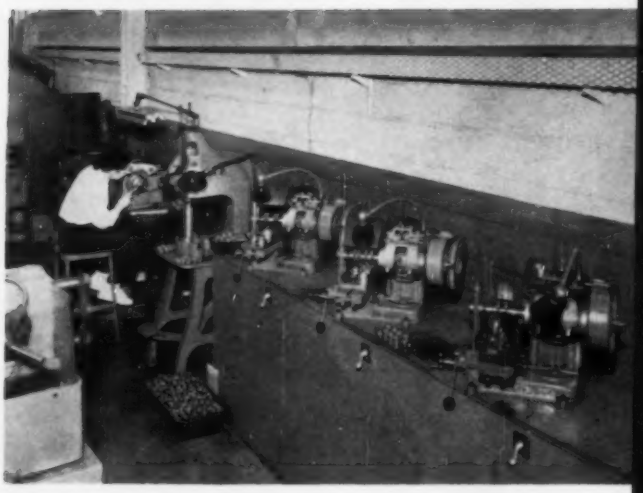
With this equipment, the shop can handle a continuous flow of small quantities, ranging from 200 to



No setup time . . .
because two-stage integral piercing and shaving dies are permanently installed in presses. Key slots are stamped in various sizes of rough cartridge blanks in different quantities

More no-setup time . . .
where special milling machines are always tooled for a wide variety of parts. Individual tooling is established for each type of Microbore toolbit cartridge

New thread roller . . .
means two machines can be set up for morning and afternoon runs. This increases possible number of batches without cutting into production time for setup



Three machines replace one . . .
but the light-duty hand millers stay tooled to produce flats on three cartridge sizes. Old machine was a heavy-duty general-purpose miller

Inventory into Capital

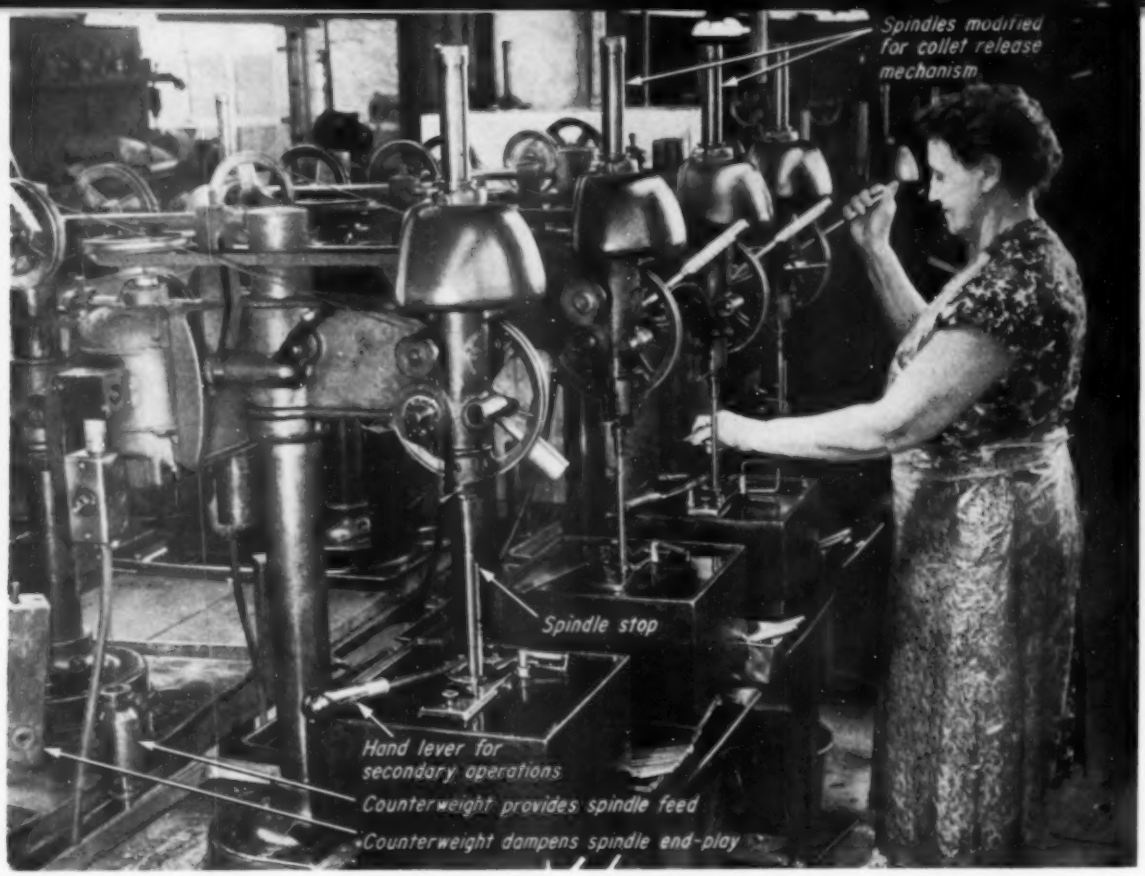
300 pieces on standard items—less for specials. In many cases minimum and maximum stock quantities have been established to help avoid frequent setup changes for extremely short runs and long machine tie-ups and subsequent stockpiling after long runs. Daily shop work releases are based on outgoing stock orders, so stock is constantly replenished.

Lines that process a variety of standard and special boring bars have also been modernized. About 250 templets were made for a tracer-controlled turret lathe that contours the taper and front-end form on standard bars. Three special machines were built to cut the precise hole in the boring bar, in which cartridge, lock-screw, and graduated dial are fitted. Special coils and about 250 adapters have been developed for a 25-kw induction machine that heat-treats the bars. Other new equipment includes an internal grinder, special stamping equipment, a special milling setup that machines drive keyslots in bars, and chrome-plated gages.

Up until about four years ago, the shop required an in-process inventory of over 100,000 cutting tools in lots of 200 different types with as many as 500 of each kind in stock. Now about 300 kinds of bars are stocked for fast delivery as a result of the new lines, and special items can be delivered almost as fast. Production is concentrated on special sizes, while standard sizes are scheduled through on a regular basis to maintain known stock requirements.

Replacement induction coils . . .
are quickly changed to braze carbide tips to various cartridges. Note different coils on top of cabinet

Grinder setup is reduced . . .
where a large number of different machines replace a smaller number of general-purpose grinders. Setup is faster and less frequent because there is more choice on work placement


Spindles modified for collet release mechanism
Spindle stop
Hand lever for secondary operations
Counterweight provides spindle feed
Counterweight dampens spindle end-play

One operator controls . . . four modified Walker-Turner drillpresses that simultaneously perform similar machining operations on long shafts (upper left on opposite page). By working four drillpresses at once, operator has time to feed them successively, return to first machine as cycle ends

Screw machine parts from a

Impossible to turn out precision screw machine parts without a screw machine in the shop? It's being done by Marti Corp, Irvington, N J—inexpensively, too, and with no loss in product quality. Here's how . . .

What can you do with a drillpress? Drilling, tapping, milling, turning, grooving, slotting and a lot of other machining operations, too—if you're ingenious, or maybe *a* genius, like Charles Marti.

In his shop out at Irvington, N J, they're making normal production runs of precision parts for typewriters, sewing machines, instruments, appliances, and many other products, on 52 specially adapted Walker-Turner drillpresses. There isn't a screw machine in this shop that specializes in screw machine parts.

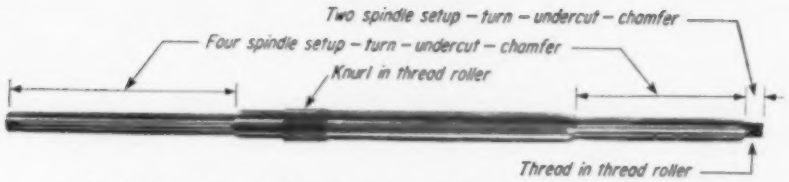
All of the parts shown in the photo above were machined on modified Walker-Turner drillpresses equipped with semi-automatic turning fixtures that can turn a maximum length of 5 in. x ½ in. dia on parts up to 31 in. long. Shortest length that can be turned is ⅝ in. x 0.008-in. dia. Average tolerances are held to ±0.001 in., concentricity between dias is 0.001 TIR, and surface finishes to a maximum of 16 mu in. rms. Note fine examples of undercut diameters—some to 1/32 in. dia x 4 in. (photo of parts, opposite page).

Marti is turning out those parts on a jobbing basis—cheaper and faster than with conventional machines, they say—and with no loss in quality and precision.

Drillpress setups have other advantages over conventional machines, too, the Marti people say:

- Initial investment is low. The drillpresses cost ten or fifteen times less than the machines that ordinarily do such work. And machine investment costs can be cut still further by using stripped-down versions of drillpresses for some special-purpose setups.
- Tooling is designed for specific jobs, with special setups geared for maximum production in a particular operation. This means that Marti can handle unusual jobs faster and easier than a shop employing conventional machine tools.
- The shop is completely flexible. Setups can be switched from one tooling fixture, for a specific operation, to a fixture for the next, entirely different operation. All special-purpose tooling is interchangeable among Marti's 52 drillpresses.
- Operation is simple. All of Marti's production workers are women with no special machine shop training. Yet they turn out work that would ordinarily require skilled machine operators.

Marti works with its cutting tools submerged in cutting oil, close to the drillpress spindle. In some cases the work is inserted in the spindle and the tool is stationary. In other setups the tool rotates and the spindle feeds


Two spindle setup – turn – undercut – chamfer
Four spindle setup – turn – undercut – chamfer
Knurl in thread roller
Thread in thread roller

. . . the four-spindle drillpress setup at left turns, undercuts, chamfers 200 long shafts like the one above in an hour, and similar drillpress setups turn out these parts . . .

drillpress? YES!

JOHN P WRIGHT, associate editor

the work only during spindle travel.

This practice of machining under coolant assures a fine finish and long tool life, while proximity of the cutting tools to the spindle and guide bushings assures accurate concentricity, closer tolerances.

Another shop practice: when long shafts are to be worked, and auxiliary V-shaped workholding fixture is attached to the drillpress collar. Thus, operator chucks work quickly.

Now, by way of example, let's look at the setup pictured at the beginning of this article. Here, one operator controls four machines—each tooled to perform identical turning, undercutting and chamfering of long shafts (photo above).

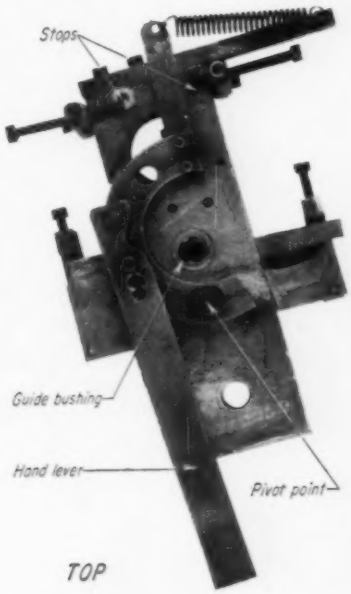
The operator places the partially machined shaft in the quick-change collet of the first spindle, then feeds the shaft through a guide bushing in the Swiss-type tooling. A counterweight attached to a pulley on the feed pinion provides automatic feed when the operator turns the hand lever past the balance point. Operator then repeats the same procedure on the next three spindles.

By the time the operator returns to the first spindle, the turning operation is completed. Undercut and chamfer on the shoulder are accomplished when the operator pulls a hand lever on a fixture that swings the final toolbits into play.

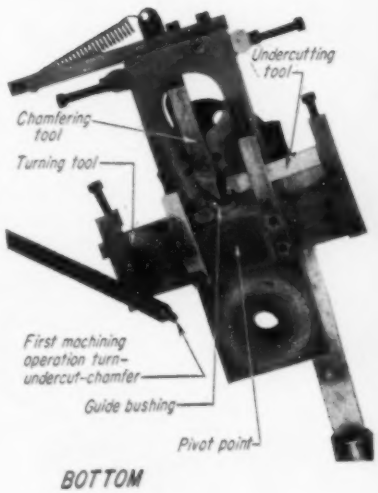
The psychology behind these independent setups was derived from a study of time and motion. For instance, an operator employing a two-spindle setup can machine only the short shoulder on the shaft's end at maximum efficiency. On the other hand, an operator working with an identically tooled four-spindle setup can operate at maximum efficiency because of the longer cycle.

Swiss-type tooling . . .

. . . accommodates several toolbits, which may be operated simultaneously or in sequence, for individual operations. After the turning operation is completed, the operator pulls a hand lever, which pivots the undercutting and chamfering tool into position. Top and bottom views of a typical setup are shown below

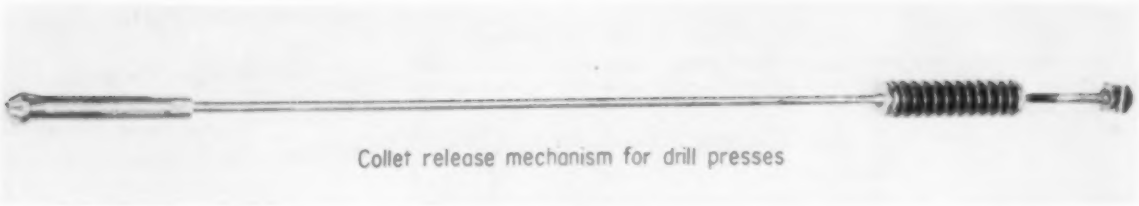


TOP



BOTTOM

Screw machine parts . . .



Collet release mechanism for drill presses

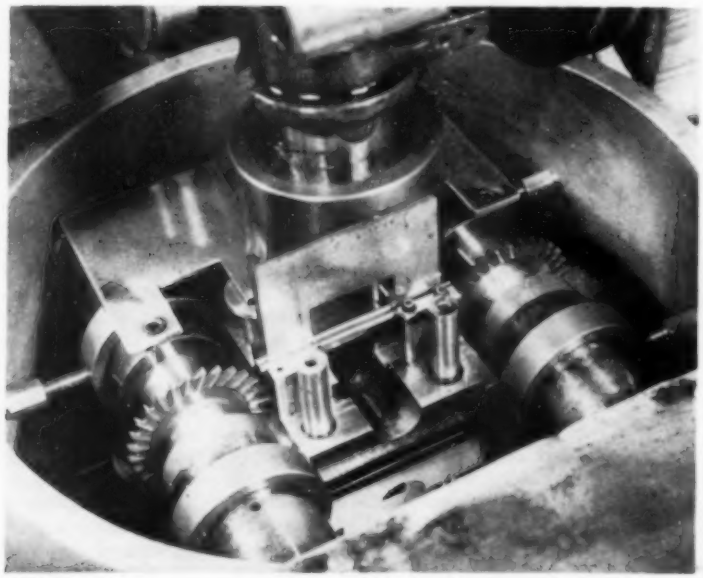
Spring-actuated collet loads, unloads parts as spindle revolves . . .

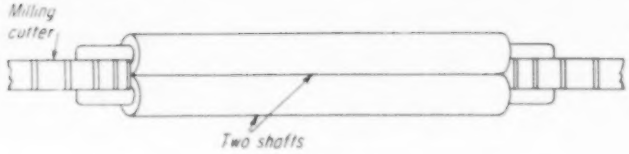
Through-hole machined in the spindle accommodates the take-up rod. At top of the spindle, a thrust-bearing and sleeve is fitted to provide for opening and closing of the collet. When the spindle rises, the spring is compressed and the collet opens. A new part is inserted while the spindle is in this position. When the spindle is lowered, the spring draws up on the collet with enough force to hold the part rigidly throughout the machining cycle

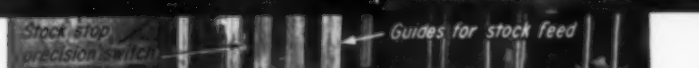
Drillpresses can do milling operations, too . . .

● This is how a drillpress is adapted by Marti to mill flats in line on both ends of two shafts simultaneously. Similar setups can be employed to mill slots on the ends of rods. The shafts are nested in V's and positioned against stops. Flat plate, attached to spindle (photo, bottom right) clamps the shafts in V slots and depresses the spring-actuated tool slide down past the cutters. Guards and cutting oil have been removed in these photographs to show details more clearly.

. . . simultaneous milling of flats on both ends of two shafts (sketch below). Close-up shows tooling, workholder and cutters . . .

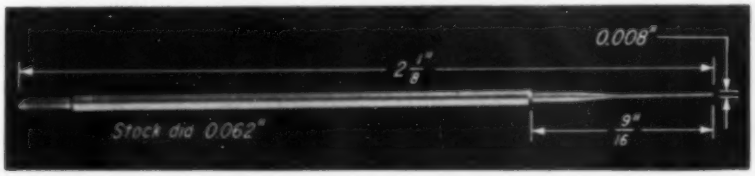


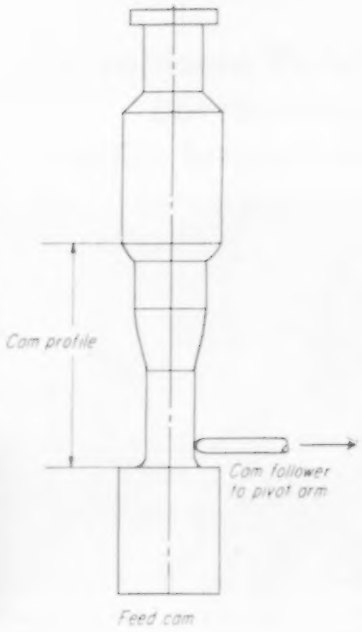


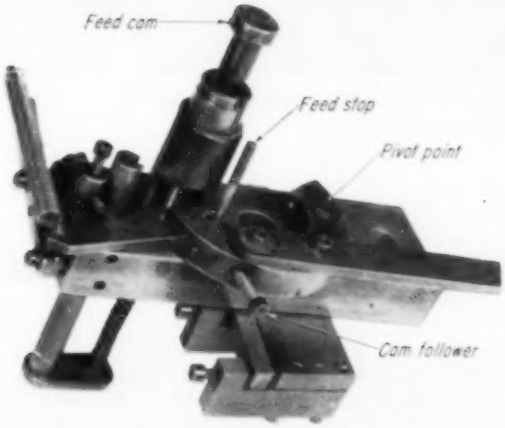


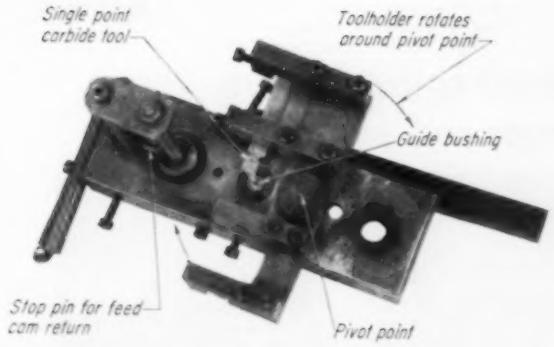
Single-spindle drillpress machines stainless parts to ± 0.001 in....

● Concentricity between diameters is held to 0.001 TIR on the drafting needle shown below, whose smallest diameter is turned to 0.008 in. x 5/16 in. long. Stainless part is machined in the fixture shown in the photographs below, and set up in a single-spindle drillpress. As the spindle descends, it feeds the stock through the guide bushing and at the same time depresses the feed cam. A profile of the part is generated as the follower transmits motion from the cam to the toolholder, which rotates around the pivot point. Note that the toolbit is practically flush with the guide bushing, eliminating deflection of stock during the machining cycle. As a result, small diameter parts can be machined to any length. Tolerances are held to ± 0.001 in. Output is 300 pcs/hr.

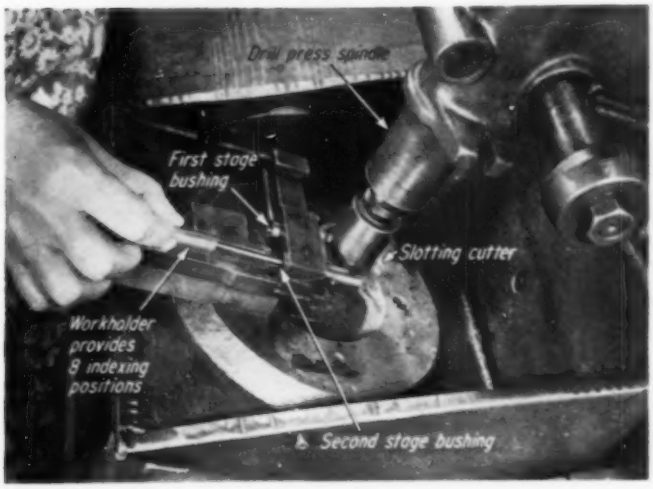






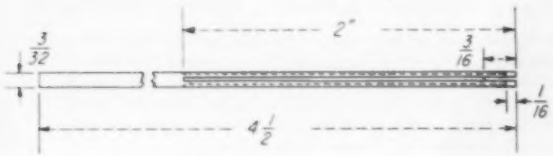


Four slots are milled in brass rod at 375 pcs/hr...



● Four long slots are milled in the 3/32-in.-dia brass rod shown in the sketch below. Note that the slots do not intersect for their entire length.

First-stage bushing (photo, left) is for cutting through two slots that intersect at the end of the rod. At this station, stops provide for cutting one slot 1/16 in. deep, while the second slot is cut 3/16 in. deep. Second-stage bushing picks up the original slots and cuts them for their entire length, but only to a depth of 1/32 in. Worktable is normally filled with cutting oil and is inclined at a 30° angle, so that only the slotting cutter contacts cutting oil. Tool life of the HSS cutter is 100,000 pieces between regrinds.



Screw machine parts . . .

Cutoff machine is a reconverted horizontal miller . . .

This cutoff machine at Marti is a reconverted horizontal miller fitted with extended arbors and an adjustable-stop collar. All parts are first cut to their overall length before they are machined in drillpress setups. Prime advantage of this setup is that cut off ends are square and free from tits. Note that the slotting cutter runs in cutting oil

Dual-spindle setup taps rod ends . . .

In tapping ends of long rods in this dual-spindle setup, rod is rotated in same direction as the tap to control concentricity between OD of rod and tapped hole. However, the tap revolves 20% faster than the rod. During the operation an oil reservoir fitted to the worktable keeps the tap completely submerged in cutting oil. Production is 300 pcs/hr

Stock stop precision switch
Guides for stock feed
Four drill press spindles
Cam controls length of each turning operation
Tooling stations immersed in cutting oil
Adjustable speed motor for feed rate

Four-spindle automatic has modified drillpress spindles

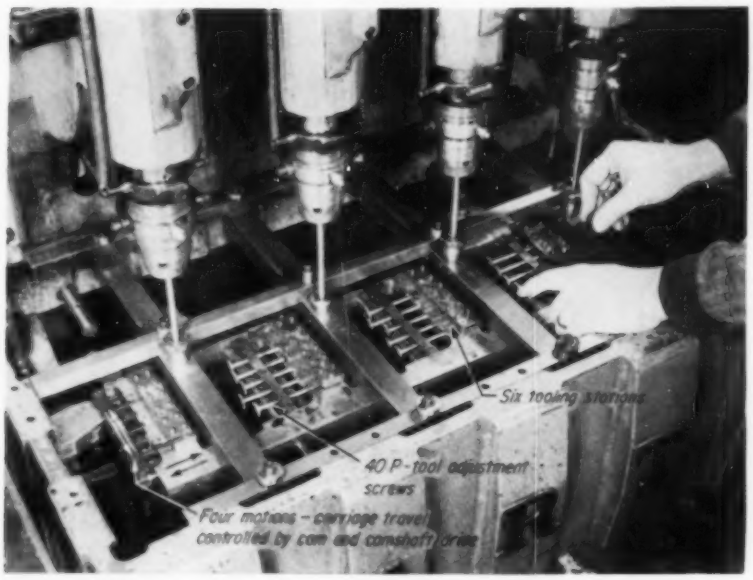
Drillpress-based

The four-spindle automatic screw machine pictured above has modified Walker-Turner drillpress spindles that can accommodate stock up to ½ in. dia x 12 ft long. Designed by Charles Marti, who began his career as a machine designer apprentice at the age of 10 in Switzerland, and who worked as a machine designer at 14 for Joseph Petermann, pioneer developer of the Swiss automatic, this machine is strongly influenced by Swiss tooling methods. Stock is fed through special collet adapters and on into carbide guide bushings. Independent tooling for each spindle is directly below the guide bushing. Cams are made on a 7:1 ratio to permit easy operating action and close-tolerance work. Spindles operate at a constant speed of 5000 rpm.

Indexing of tool stations (photo at top of opposite page) is controlled by a single cam. But feed of individual tools in each station is controlled by an adjustable-speed-motor-driven camshaft directly below the tooling stations. A second cam controls the diameter of the part at each turning operation. A third cam controls the length of the piece by regulating spindle travel—so that three cams are needed for every new job. Individual tools can be adjusted while machine operates.

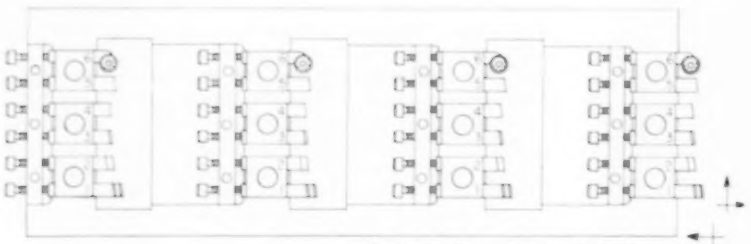
The Marti-designed multi-spindle screw machine is easily set up to accommodate a complete tooling and machining cycle for a new part (see drawing on opposite page).

It takes just 4 seconds to machine this part...



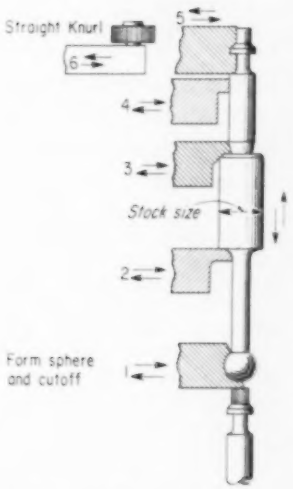
Indexing of tool stations is controlled by a single cam

multi-spindle automatic



Four-station tool carriage . . .

. . . shows arrangement of identical tooling, which indexes through six positions in machining a ball-end shaft. Simplicity of tooling allows for maximum flexibility in setup and operation. Note that only one row of identical toolbits are in motion at any one time, i.e., as stock is fed through the guide bushing, toolbits No 1 machine the sphere and cut off. Tools are then retracted by longitudinal carriage travel. Transverse travel of tool carriage puts the second row of tools into position as toolbits No 2 plunge turn to correct diameter. At this point, the spindle descends and feeds the stock downward for correct machining length. Sequence of other tool and carriage motions follows this same pattern until part is completed



Complete tooling and machining cycle . . .

. . . for this part takes only 4 seconds, or four completed parts in 16 seconds. Tolerances on this shaft are held to ± 0.001 in. Tool wear is one-fourth that of normal wear for conventional single-spindle machining methods because four tools are used instead of one. Complete setup time is less than that for a single-spindle automatic. Machine is adaptable to short runs because, in applications such as this, only one spindle need be used. Once the machine is set up, it can be operated by unskilled personnel

Who speaks for small business?

ELTON T BARRETT, president,
CGS LABORATORIES INC, STAMFORD, CONN

Can small business take care of itself? Today, just about everybody is worried about the answer to this question—except small business itself

There are many who purport to speak on behalf of small business: local Chambers of Commerce, national manufacturers' associations, politicians, the government's Small Business Administration. But it is doubtful that any of these groups really speaks for, or knows what to say on behalf of, small business.

Small business itself has few spokesmen, because almost every small business man is busy running his small business; he has no time to make his thoughts known to others. Moreover, he doesn't think of himself as a philosopher. His philosophy simply is to keep his own little business making money. By and large, he's good at it, too.

Here I am setting forth the thoughts of only one small business man—with the hunch that there are other small business men who, like myself, belong to none of the groups that persist in speaking for him, and who may agree at least in part with what I say.

"Small business" has been defined in many different ways. In some definitions, the number of employees is the criterion; others take into account the relative position of the business in its own industry. Other definitions may give weight to net profit, capitalization, number of branches, or gross sales. For my purposes, I shall define a small business as one that can't afford or doesn't have even one employee with the duty of publicizing the official attitude of the company and with the time to attend meetings where "problems" of small business are discussed.

Every day, literature on small business crosses my desk enroute to the wastebasket. Much of it is generated by the government, much of it by voluntary associations set up to consider and be helpful with the problems of small business. These literary gems seem to be based on somewhat contradictory assumptions: (1) It is good to have small business; (2) small business is a fragile and delicate social organism that must be given special care and nourishment, lest it die; (3) it is bad that so many small businesses fail; and (4) if it weren't for small businesses, the undesirable monopolistic industrial giants couldn't exist.

It is with the second assumption that I have my principal quarrel. With respect to the third, I only wonder whether it would be better if a small business doomed to failure grew larger before it failed.

Small businesses are spread the length and breadth of the land, producing, distributing, or consuming—day in and day out—almost every conceivable product of our economy. They are run by a hard, tough, loyal, and intelligent group of business men who are instantly sensitive to changing conditions, and who have the power to change quickly the directions of their businesses.

Daily, this group solves complex problems of labor relations, financing, and production techniques. These men are jugglers of situations—they do know their businesses. They neither need, want, nor expect special consideration from the government or anyone else in their fight for economic survival. What they get, they

are willing to pay for—and what they sell, they will get paid for.

IS FAILURE "BAD"?

Not all small business men fit the above pattern. Each year, many thousands of small businesses fail. Usually, a small business fails because it didn't make a profit: Whoever directed the business probably couldn't or didn't juggle fast enough all the problems that must be juggled to come up with a profit.

The only justification that any business has for making a profit is that it renders someone else a service. To render a service, the business must have discovered a service that others desire; it must have devised means to provide this service at a competitive price, and it must let others know the service is available. A small business with these attributes is likely to prosper. A business that is not of service to others will not long survive.

Is it bad that such a business fails? *Far from being bad, failure may be an essential ingredient of our business system.* Free enterprise, we sometimes call it. Freedom to take careful, conservative action—freedom to make daring moves—freedom to take risks—freedom to make a fortune if our juggling is good enough, freedom to go broke if it isn't. If we remove the freedom to go broke, how else can we test the soundness of the particular business actions we select? How else can we test the value of the service we render?

CAN SMALL BUSINESS COMPETE?

Far from being a delicate organism that requires big-business planners to watch out for its welfare, small business is a hardy social institution capable of such quick adaptation to new situations that it would be difficult to stamp it out.

But the planners insist that small business can't compete with big business. If a big business could react to situations as quickly as the average small business, there might be some logic in such a contention. But so far, big business has not developed this capability. In our small company, we frequently accept, manufacture, and ship an item in less time than it would take some large companies to get the paperwork well under way.

Moreover, the small business is a real competitor on small and special orders. Frequently, the experience and know-how gained on such special or small orders enables the small business to hold the market as the size of the orders increases. More than one small business has become a big business by this route.

What about the statement, heard frequently, that small business cannot compete because big business pours millions of dollars into research and development? A small business *can compete* here, too, because of the more limited scope of its activities. If we think of development money in terms of the *scope of developments*, the small business can pile its development money just as high—over a smaller area—as the big company. Small business can become just as much an expert in its own special field as would ever be economical for a big business.

IS THE PATENT SYSTEM FAIR?

What about the contention that giant patent pools of big business stifle and suppress small business? These arguments, like so many others, are usually presented as generalized ideas of what one thinks ought to happen. They are never supported by authenticated facts, and thousands of case histories to the contrary are usually ignored. The patent system has been under fire in the courts for more than two decades; there always seems to underlie the decision of the court some vaguely expressed thought that the weakening of the patent system is of benefit to small business and the public.

Big business could exist, prosper, and grow even if the patent system were abolished. But could small business? Could a small business afford to invest in a new development (with the likelihood that it must establish new marketing channels after the development has proved successful) if a big business with already established marketing channels could copy the new product with impunity? Most big businesses do not expect to make a profit from patents. In most cases they acquire patents for defensive reasons.

All that small business asks of the patent system is that, when it finances developments with profits or investment capital, it have a right to the exclusive use for a limited time of that part of the development that is "new," without any impossibly vague and uncertain standards of patentability such as a "flash of genius." A sound and fair system for protecting new developments will advance small business to a remarkable extent. Small business can compete in the business of making inventions.

CAN QUALITY WORKERS BE HELD?

Can a small business acquire competent employees against the competition of big business? Big business offers sick benefits, insurance plans, retirement income, and many other extra benefits—all backed by the financial security of the big company. There are many individuals whose desire for security, steady income, and retirement provisions is dominant. Such people are attracted to big business.

There are fortunately many others, in whose veins flows the entrepreneur's blood, who want something very different from maximum security. These are the people who want a chance to contribute to the success of a business under circumstances where the results of their efforts are readily detectable and where they can share in that success. Small business can offer this incentive and thereby has the chance to hire more productive employees than big business.

In our small business, we think it is of great advantage to let all our employees know as much about the business as we can. We share with our employees the rough jolts of the cash squeeze, the order we almost got (but which we have just learned went to a competitor), the contract on which we have lost money. We also share with the employees the news of a fat new order, a profitable month, future hopes, and general plans. All our financial records (except individual salaries) are open to all our employees all the time. Big business doesn't seem to be able to generate the degree of enthusiastic employee-support that is available to small business. And a lot of employees want desperately to work for a company they can be enthusiastic about.

Even in the search for such scarce talent as electronic engineers, the small company can compete. It can do

We think the views expressed in this article are refreshingly provocative—especially because they are the opinions of an experienced small business man. We'd like to hear of any reactions—pro or con—that you might have had as you read Mr Barrett's story.

more than just compete: It has a chance to employ technical geniuses, who will not follow the protocol required by most big businesses. The small business can be flexible enough to employ such genius successfully.

In a small business, "dead wood" is more readily detectable, and fellow workers have a more direct interest in getting rid of it. Big business seems to carry with it a greater percentage of non-productive employees than small business. Perhaps this is the inevitable consequence of the aging of the business. Because small businesses are in general younger, they have less non-productive labor. Another possible reason: In a small business, management has to "put its men in the field" with minimum training. Generally, it cannot afford the long years of training provided by large companies. The man who cannot assume increasing responsibilities fails sooner in a small, growing business.

DOES SMALL BUSINESS NEED HELP?

A large and important section of our economy is made up of thousands of small businesses competing vigorously to stay alive, to grow, to become big businesses. These businesses, in one sense, form a gigantic business-research laboratory. New business methods are devised and tried, old methods are modified and tried again, business practices and philosophies vie for the customers' dollars.

Some experiments succeed, and their success in a small business introduces new manufacturing processes, new products, or new methods of distribution into the business world. Other experiments fail to meet the stringent tests of the market place, and frequently carry the small business into bankruptcy. Out of this great melting pot of successes and failures comes a continuous flow of new products at lower cost. The consuming public is the biggest beneficiary.

In any research program, experiments that fail to produce a worthwhile product must be discarded. To prop up an unsound business artificially is like con-

tinuing a development program that has shown negative results. Every business man knows how fast you can throw dollars down that kind of rat-hole.

There is no doubt that aid for small business looks like an attractive program to a politician. It makes good casual reading for the public. *But is it really good for anyone?* First, even the most ardent supporter of artificial props for inefficient businesses seems to agree that tax money should not be used for this purpose if capital is available from a private source. Capital is always available unless prudent business men believe the investment is unsound. It isn't necessary to convince many investors that investment in a business is sound—it is necessary to convince only one. If a small business cannot convince a single investor that what it has to offer is sound, I doubt the soundness of any contrary opinion of government administrative agents.

Just for a moment, let's look at this through the eyes of a soundly operated small business. Such a business has its crises, which are in no small part caused by the severity of competition. If a competitor cuts prices to the point that the sound competitor loses money, it takes business away from the soundly operated company. Does it seem logical to use tax money gathered from soundly operated businesses to bolster and keep alive the unsound business competitor?

DO ARTIFICIAL SUPPORTS WORK?

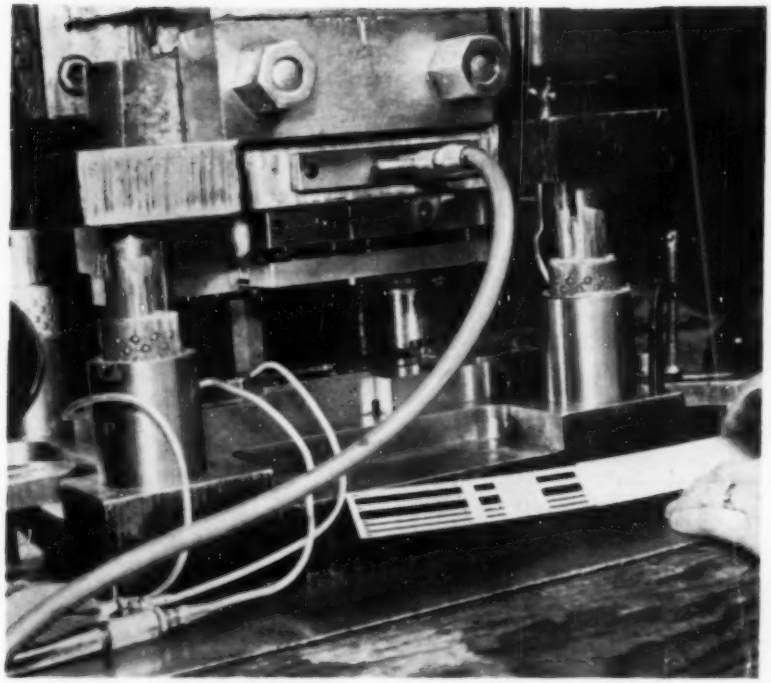
What about other indirect means of artificial support for small business, such as earmarking for it certain government procurements? In practice, help from this source is more myth than fact. Most of such invitations to bid require no special skills or unusual machinery. Usually, the restriction of a procurement to small business leads to the conclusion that large-scale procurement of the item is not contemplated in the future. Successful small businesses in general have specialized skills and production techniques frequently coupled with special or unusual tools. Such firms are not attracted to the production of items "reserved for small business" for exactly the same reason big business wouldn't want to bid on it: There is not enough profit to make it worthwhile, unless the business is already on the ropes and desperately needs work merely to hang on a little longer. Such contracts seem to damage the contractor who takes them about as often as they help him. The active, progressive small business knows its own special business. It is quite ready and willing to compete with the biggest! We do it every day.

WHAT HELP IS NEEDED?

What sort of assistance, then, does small business require? Graduated corporate income taxes? No, because we can pay as much tax out of each profit dollar as the biggest business, and, more importantly, we are working very hard and taking continual risks to become a big business. If we are successful we expect to make a lot of money and we don't want it taxed away unfairly.

How about the type of anti-trust actions that have become common the past two decades? Do these help small business? The answer seems to be, to no more extent than they help the general public—and the benefits to the public are highly debatable. This is especially true of the type of anti-trust actions that are founded more on unvoiced (and perhaps unrealized) jealousies than on the possibility of helping the public. Such actions take away some of the incentive for a small business to produce goods or render services at such low cost that it will become a big business—at least to the extent that mere bigness carries with it the certainty of an anti-trust action.

Small business doesn't want or need special help. But it doesn't want any unnecessary road blocks thrown in its path. As one small business man, I say, thank you, Uncle, for your offers of special aid and assistance, but we and the public will be better off without it. We are a sturdy lot, we small business men, and we can meet changing conditions with surprising agility and some acumen. We aren't too certain we can survive with too much help.

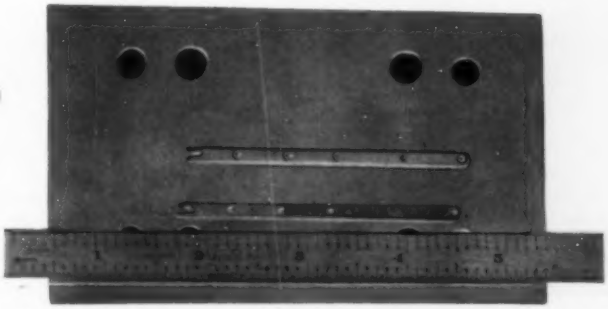


Plastic hose delivers air to punch shoe . . .
throughout press cycle; air cleans off stock as it feeds. Three copper tubes blow air only when ram is in upper position, thus ejecting parts

Air jets improve die action with thin stock

LEONARD G PANGBURN, foreman, die repair shop, MINNEAPOLIS-HONEYWELL REGULATOR CO, MINNEAPOLIS

They are drilled through punches and into dies to release slugs and stock from the die members, to blow out dirt, and to cool small punches. The technique has helped to solve a number of troublesome die problems



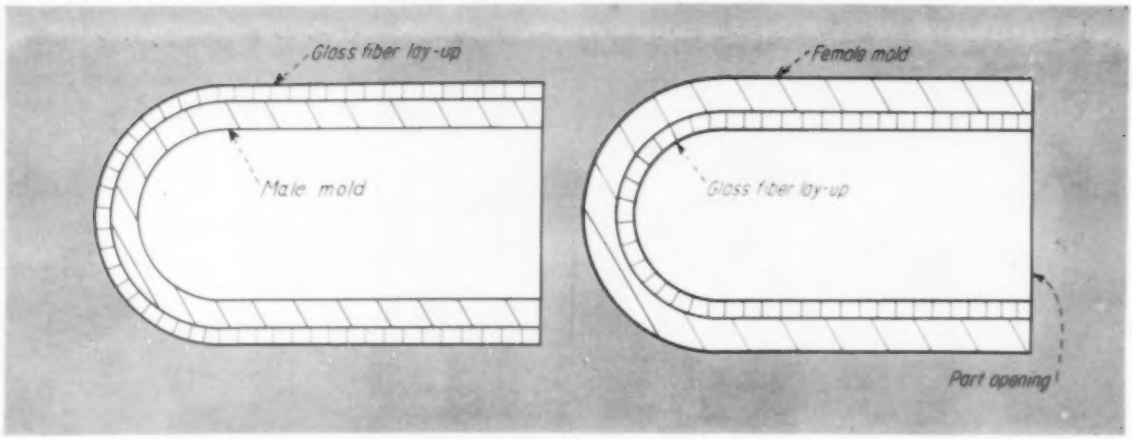
Four tiny punches . . .
that pierce a small phosphor-bronze switch blade are drilled through to produce 0.015-in. air jets. These prevent tiny slugs from sticking when punches rise

Blasts of air from small jets can clean away slugs and eject pierced parts when thin stock in phosphor bronze and other metals is stamped. In some cases the air jets replace spring-loaded ejection pins, and save money in the process. Air power is from the regular shop supply, often fed through plastic hose and a quick-disconnect coupling to a manifold in the punch or die member.

Jet openings are small, ranging from 0.010 in. up. They are effective when the stock gage is around 0.005 in. or so. If the air jet is to raise the stock for ejection after a press stroke, air must be cut off until the ram comes up; otherwise the air will prevent the stock from nesting in the die.

When holes are drilled through punches, air may flow continuously. Air jets blow dirt away from the mating die faces, and therefore reduce wear from abrasion. In addition, air flow cools thin punches.

Jet passages are usually manifolded into larger drilled holes to which quick-disconnect couplings can be assembled. Trimming die members for switch blades (above) are drilled to produce 1/16-in. air jets.



Simple lay-up . . .
over male plug presents no difficulty, but cured outer surface lacks aerodynamic smoothness required in high-speed flight

Smooth . . .
outer surface can be obtained by using female mold, provided bottom is within operator's reach and opening is large enough

"Bladder Molding" Forms Smooth Plastic Laminates

J A BAGLEY &
F M PARTRIDGE
CHANCE VOUGHT AIRCRAFT
DALLAS, TEXAS

New bonding technique and new tool design permit wider use of plastics in aircraft by making possible molding of glass fiber laminates in shapes previously considered impracticable. Costly, and heavier, metal structures can now be avoided

Glass fiber and plastic laminates offer many of the attributes of metallic castings and sheet-metal work with the advantages of considerably reduced weight and easier fabrication. However, when shell-type laminates are required, having a high ratio of depth to diameter, considerable difficulty may be experienced in laying up the form. Placing the laminate over a male plug presents no difficulties, but the outer surface will be a "free molding" surface and therefore generally unsuitable as an aerodynamic surface.

To obtain an aerodynamically smooth outer surface, the obvious solution is to make use of a female mold. Here, however, difficulty will be encountered if the depth is such that the bottom of the mold cannot be reached by the operator's arm, or the diameter is so small that he cannot enter bodily. Trouble will also be encountered when, even though the depth is not too great for access, the opening is so small that layup work with tacky preimpregnates becomes difficult.

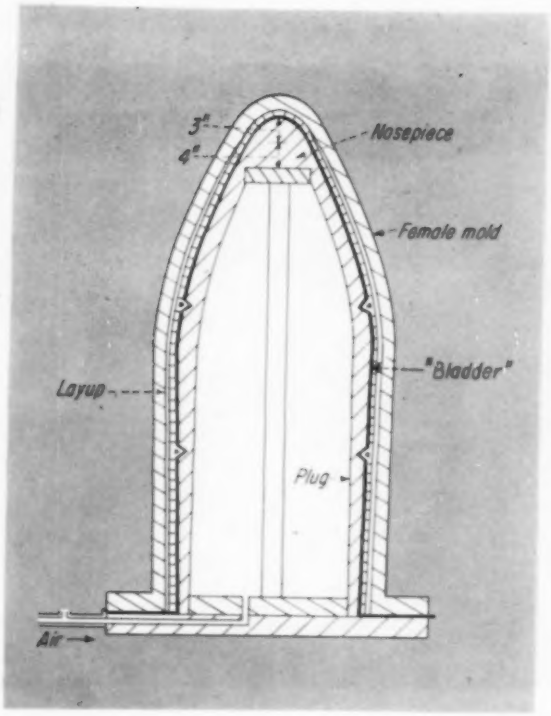
A solution to these problems has been found at Chance-Vought Aircraft by use of a technique tentatively called "bladder molding." In this process a vented male plug is covered with an envelope of polyvinyl-chloride or polyvinyl-alcohol film, and resin-impregnated glass cloth is laid up over this. The assembly is then inserted into a female mold whose inside surface has the desired final shape and smoothness. The complete setup is placed in the curing oven and compressed air is supplied to the interior of the male plug. Air pressure expands the plastic envelope, forcing the impregnate away from the plug and into close contact with the walls of the female mold.

The female mold is a two-piece aluminum casting provided with longitudinal flanges for bolting the two halves together and a base flange for sealing the envelope. The male plug is a hollow aluminum casting with a separate aluminum nosepiece.

The top 3 in. of the nosepiece is machined to provide a clearance of 0.040 in. per side between it and the mold wall, or 0.010 in. per ply of preimpregnate. The lower 4-in. portion is faired down to increase the clearance from 0.040 to 0.120 in.—an allowance of 0.015 in. per ply, plus 0.060 in. to facilitate insertion of the wrapped plug into the mold. The plug is machined to provide 0.120-in. clearance over its full length, except that the lower 12 in. are tapered to allow a uniform change in impregnate thickness, from 4 plies at 12 in. from the open end to 8 plies at the open end.

The 0.040-in. clearance at the top is designed to compress the 4 plies of 0.015-in. material to a total thickness of 0.040 in., which is the final thickness after curing. Compression is obtained by mechanical pressure when the baseplate is tightened against the female shell during insertion of the male plug and lay-up. The system of clearances was decided upon to avoid the tedious task of providing the exact amount of excess material for "ballooning" in this area where the amount of excess is critical because of the particular part configuration.

Longitudinal and circumferential V-grooves are machined in the male plug to permit incorporation of balsa wood stiffeners into the lay-up. The plug is then slit into six segments,



Bladder molding . . .
setup permits making lay-up of preimpregnate over male plug, expanding it by air pressure to conform to smooth walls of female mold

Completed . . .
glass fiber-resin laminate, showing built-in reinforcing ribs. Part is ready for use, except for light flash removal at mold parting lines and drilling of mounting holes

Component parts . . .
of plug and mold for bladder molding, with finished part in place in LH part of mold. Plug is sectioned to permit expansion and removal and is supported by disks on tubular central stem

with a 0.125-in. slitting saw, and 0.125-in. aluminum shims are inserted into the saw kerfs to retain the original diameter.

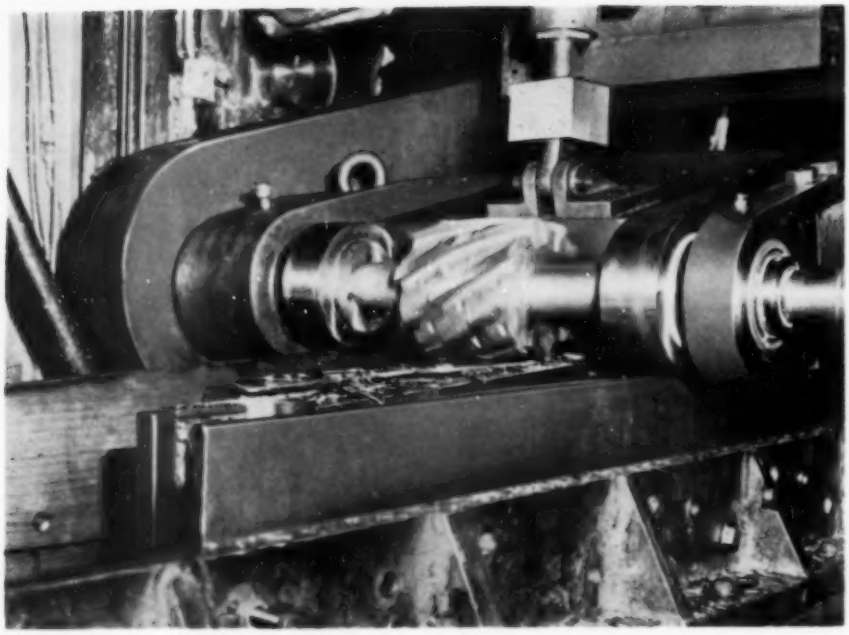
An assembly stand was made of 1-in. aluminum plate with a retainer disk fitting the ID of the male plug. To this is fastened a length of 1-in. pipe terminating in an upper disk adjacent to the nose plug location. Air is admitted through a channel in the baseplate and lower disk. Both the mold and the inner plug are indexed to the assembly stand for foolproofing.

In operation, the male plug is covered with a PVA or PVC diaphragm, and several plies of preimpregnate are placed over it, depending on the thickness requirement of the part. The mold is coated with a parting compound and both halves bolted together. Then the plug and lay-up are inserted and fastened to the baseplate to position and seal the assembly. The complete unit is placed in a curing oven, and air at 90 psi is applied to the inside to force the impregnate against the inside surface of the mold. The only finishing operation required is to sand off the light flash where resin is squeezed out along the seams of the mold.

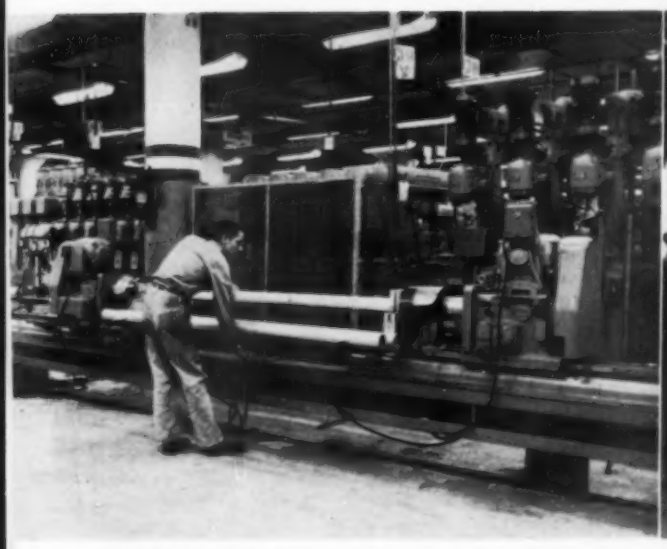
Tooling time for building the mold and plug mounted to 243 hr as against 1725 hr for making tools for the several sheet-metal parts that would be required for a corresponding metal unit assembly. Production time for the plastic part is 13 hr, against 63 hr for metal construction.

Aside from the cost standpoint, the plastic process permits designs, not permitted by other means, to obtain lighter-weight construction of integrally stiffened structures, simplified by elimination of riveting or welding of stiffeners and doublers. Doublers can be added to glass fiber assemblies by merely adding additional layers of material where needed. Parts may be tapered to transfer design stresses proportionally, as desired, and parts of complex contour may be produced. Metal bands or wood-core glass fiber stiffeners can be bonded integrally with the skin and may be curved or contoured to direct the transfer of forces as desired.

SHOP SHOTS

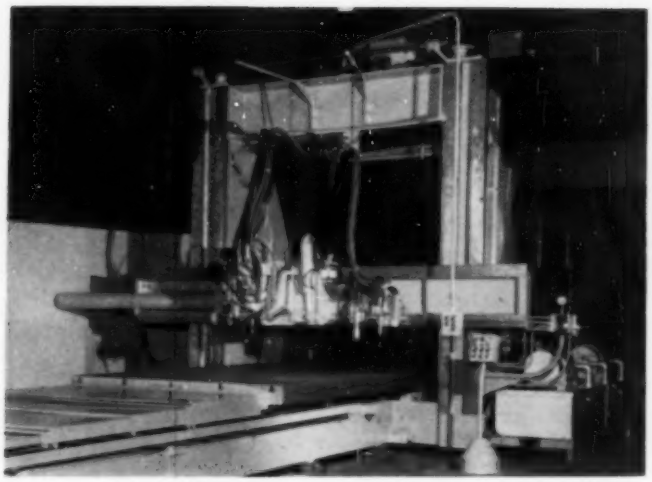


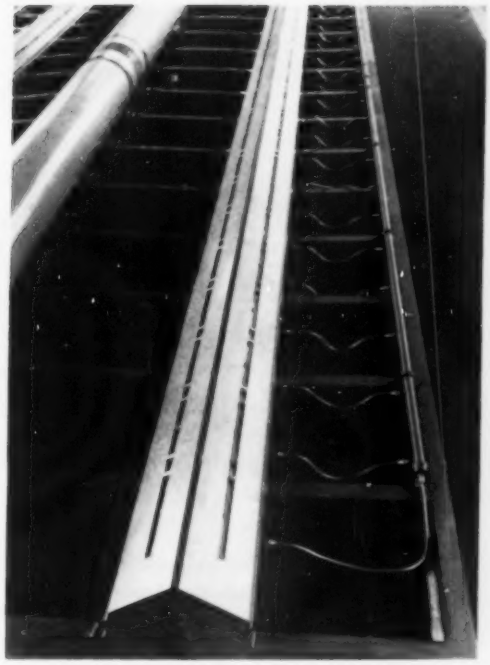
Ball-bearing templet followers . . .
are part of the cutter assembly when SAE 4130 parts are contoured. Cutter has inserted helical carbide blades that may be adjusted by wedges and serrations to compensate for wear and regrinding. Cutter-arbor assembly, supplied by Goddard & Goddard, Detroit, includes side-thrust features in each of the two Briney bearings. Installation is at Chance Vought Aircraft, Dallas, where $700 was saved initially over conventional milling practice



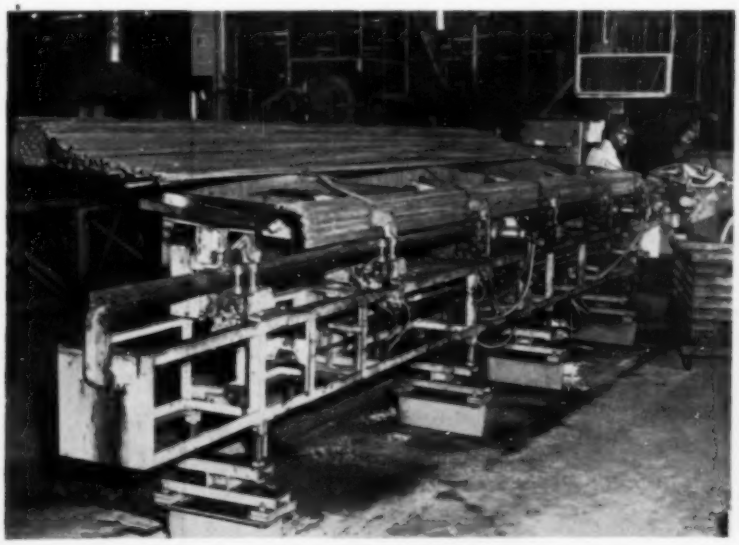
Shop-built lathe . . .
grips 10-ft rocket tubes with air clamp so tube ends can be bored and faced before plugs are welded in. Unit was built from scrap to replace a turret lathe. Machining time was 5 min; now is 30 sec. Machine was developed for Chance Vought Aircraft, Dallas

Another jury-rigged machine . . .
at Chance Vought is a belt sander that works on main beams for F8U-1 Crusader Navy fighters. Beams were hand-filed to make them seal perfectly flat against the wing skin—necessary because the wing is an integral fuel cell, and fuel leaking cannot be allowed. The machine finishes beams five times as fast as older methods and stays within the cresting limit of 0.001 in.

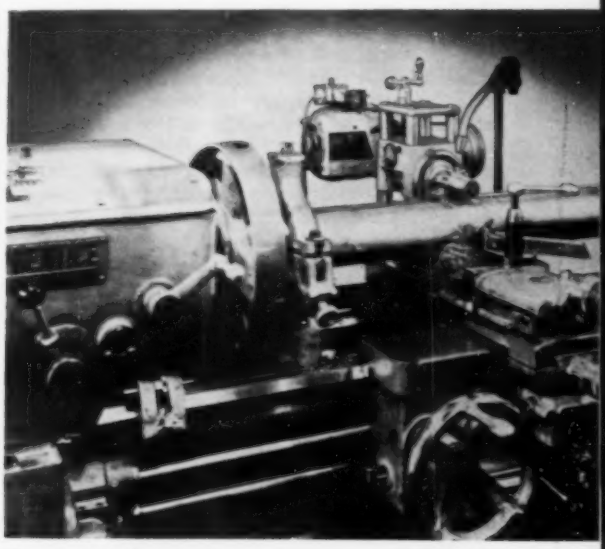




"Swarfing" means milling a twisted surface . . .
This hydraulic tracer-controlled spar miller was converted for swarfing from a double-housing planer by Botwinik Bros, Worcester, Mass, at a cost of $250,000 less than a new comparable machine. Original planer bed, uprights, and crossrail were retained, but bed was extended to support 9-ton cast table. New head will tilt 15° to either side for swarfing cuts, and is controlled by True-Trace contour tracer and tilt tracer. Hydraulic lines in table deliver oil that lifts table while it moves. Machine handles work 5x20 ft, and will contour circles and curves to 0.002 in.



Bar feed serves an alligator shear . . .
that cuts stock for automotive steering links at Thompson Products. Unit is an AML feed, made by Lipe-Rollway, Syracuse, to handle stock 14 ft long and 5/8 to 1 3/8 in. in dia. Stock gravity-feeds down rack, and is air-fed to stops at shear. Feed and shear serve six upset forging machines, and beat hand-feeding by 33%



Two operations at one setup . . .
are done on 4-in.-dia shafts mounted in a 14-in. Reed-Prentice lathe. After shaft OD's are turned, Dumore Versa-Mill on rear slide is traversed with lathe leadscrew power to cut a keyway 3/4 x 1 1/4 in. Shaft is clamped with steady-rest close to head, which is rotated to drive leadscrew while spindle center freewheels against end of shaft

Cardboard model

A simple model, easy to make, shows that a simple, low-cost conveyor can be adapted to a complex operation

Some pieces of cardboard and a few simple calculations recently helped us select the most economical conveyor for our nickel- and chrome-plating operations. We proposed a certain conveyor, then made a model that proved the conveyor would work.

At first glance a power-and-free conveyor, with its high flexibility, seemed to be mandatory. But power-and-free systems are expensive. We had a hunch that a fixed trolley conveyor could be made to do just about as good a job. The cardboard model proved our point: Now installed, the trolley conveyor cost only a third as much, and paid for itself in three months.

The "Before" sketch shows what an awkward handling problem we used to have. Parts had to be racked, carried to the nickel-plating machine, then to the chrome-plating machine, and finally to an unracking station. At each of these places racks of parts tended to accumulate, taking up floor space. The nickel-plating machine, for instance, could plate a whole day's racking in a few hours; for this reason a large backlog of racks cluttered the floor around this machine most of the time. Clearly, if we could get the racks off the floor, up on a conveyor, we would free floor space and eliminate much handling.

PROBLEMS WE FACED

A conveyor would have to be adapted to certain conditions in our shop:

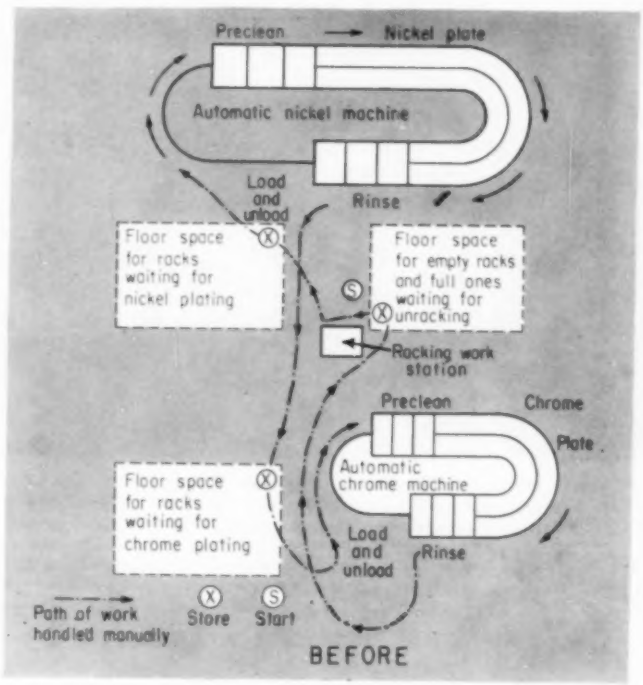
- Each of the 14 different kinds of small parts we make has a different rack and unrack time.
- Work schedules vary.
- Racks have to be available when a plating operator needs them.

The power-and-free system, in which parts are automatically shunted off a powered conveyor onto "free" sidings, would have solved these problems perfectly. But could a less-expensive trolley conveyor, carrying racks on equally spaced hangers, fit our setup?

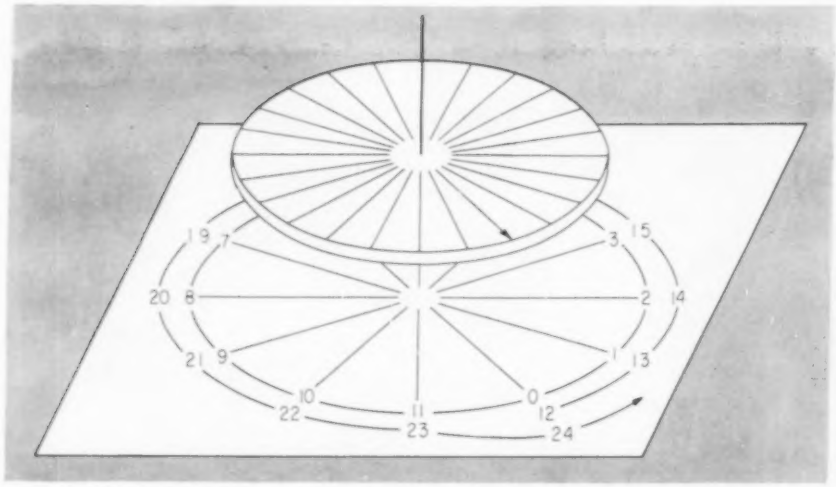
If the trolley conveyor were continuously in motion, would a loaded rack be available to a machine operator when he wanted it? If an operator took a rack of plated parts from the machine, then turned to place it back on the conveyor, would an empty hanger be there? If the conveyor were to work successfully, certain hangers would have to be loaded with racks, others left empty. But we didn't know whether we could establish a loaded—empty pattern that would work consistently. To find out, we made a model that simulated actual production conditions.

MAKING THE MODEL

A study of the new layout indicated that our conveyor would have to be 220 ft long. We decided to put



Before and after . . .
sketches show how installation of conveyor simplified handling of parts. Notice great reduction in work handled manually



Disk representing conveyor . . .
and its 80 equally spaced hangers is pinned to spirally marked sheet that shows conveyor movement in minutes. When disk is rotated, position of any hanger at any time can readily be seen

selects conveyor

PETER C NOY, Small Appliance Section,

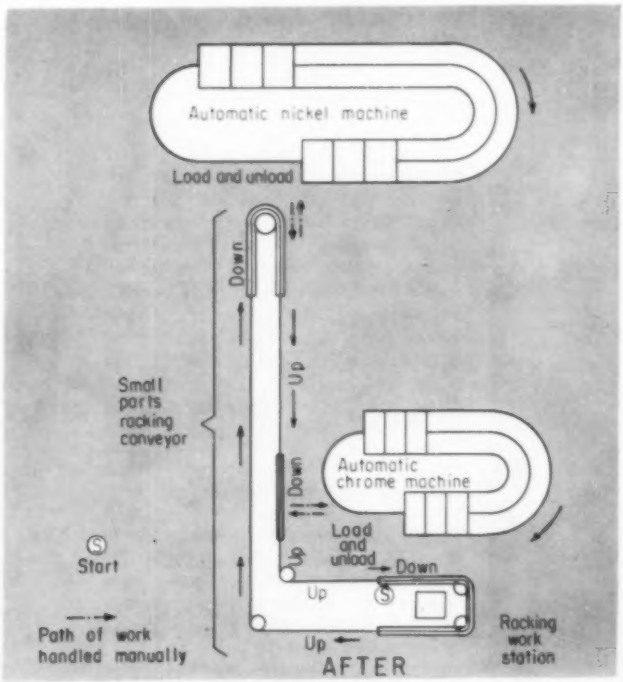
CANADIAN GENERAL ELECTRIC CO. BARRIE, ONTARIO

80 hangers, equally spaced, on the conveyor. Conveyor speed, we determined, should be 18 fpm. The "After" sketch reproduced here shows the actual layout of the conveyor, the machines, and the racking stations.

Because the hangers on the conveyor were equally spaced, we could reproduce their positions on a circle. We reduced this large circle—the 220-ft-long conveyor produced a 70-ft-dia circle—to around 9 in. with a scale of ⅛ in. to the foot. By dividing the circumference of a 9-in. cardboard disk into 80 parts, we could show the position of any of the 80 hangers.

Next we found how many angular degrees the conveyor would move in 1 min:

$$360 \div \frac{220}{18} = 29\tfrac{1}{2} \text{ degrees per minute}$$



Now we fastened a large sheet of paper to a desk and drew several radii, each 29½° apart, from a point. We numbered these consecutively, each number representing one minute's travel of the conveyor.

We put our model together by pinning the disk to the sheet (see sketch). With this model, we could see where any of the 80 hangers was, at any time during the conveyor's movement, simply by rotating the disk over the sheet.

SIMULATING CONVEYOR MOVEMENT

To simulate what would actually happen on the conveyor, we put small pieces of paper, representing loaded racks, on the disk. We turned the disk, removing pieces of paper when they reached the point where racks would be removed for plating. We then "plated" the paper "racks," allowing time for them to go through the plating machine. When this process was completed, we imagined an operator needing an empty hanger on the conveyor to put the plated rack on; if none were available, we made one simply by taking a piece of paper off the disk. In this fashion, we made a loaded—empty hanger pattern for the entire conveyor.

The conveyors in the plating machines were reduced to disks in the same way. Two planners sat down at a desk with our probable production schedule and reproduced in an hour what would happen in a day's work. They even varied the schedule, throwing in emergencies—such as a shortage in the line because a certain part wasn't available. The simple model answered problems that normally have to be solved by very complex mathematics.

Our model—we call it the Ouija Board—simulated actual conditions very closely. We found that the conveyor would work. Our report to management stated that an operator would have a loaded rack (or an empty hanger to put a loaded rack on) available when he wanted it at least 93% of the time. And in at least two other cases, similar models have shown that a fixed-trolley system can do the work of a power-and-free system.

1 . . . A farm girl is screened . . .
at Caribe General Electric after a preliminary series of interviews by the Puerto Rican Employment Service. A neighborhood girl, she answers the personnel manager's questions about education (all applicants must have some high school), experience, is carefully watched for work attitude, alertness

. . . "green" farm girls like these are being turned into highly skilled assembly workers in just a few weeks. It's all part of a unique government-industry program that's producing a made-to-order workforce for incoming American metalworking plants . . .

Puerto Rico puts

ROBERT N SHEETS, associate editor

Revolution in Puerto Rico? Not the comic opera, new-president everyday kind perhaps, but they're having one down there just the same—a quietly efficient one that is turning hereditary farmers into a competent industrial workforce.

For on that tiny island an industrial revolution is going on comparable to that of 19th Century England. And the basic problem is just the same—how can a nation of farmers and hand craftsmen be taught the complexity of skills required by modern industry?

In solving this problem, Puerto Rico has borrowed heavily from its protector nation, the United States, adapting the best of American vocational training methods, and adding a few new training concepts of its own.

The results have been spectacular, so much so that perhaps the United States can now borrow back its vocational training ideas with interest from Puerto Rico. In scarcely more than a decade, this program has produced a competent workforce tailor-made to the needs of a wide variety of incoming American industries. Green farm hands have been turned into production workers second to none, and many of the island's natives are today ready to assume supervisory and top management positions.

NECESSITY IS THE SPUR

Spur to this achievement has been necessity. With Puerto Rico it has been a case of "change your age-old ways or face slow economic death." That's why Puerto Rico's government some 15 years ago took up the challenge with its "Fomento"

2 . . . tested . . .
Job applicant's general mechanical aptitude and dexterity (Puerto Ricans rank high in both categories) are determined by the assembly supervisor

3 . . . learns how a plant operates . . .
Chain of command, function of everyone in the plant from the president down to the sweeper, are thoroughly explained, as is the part each worker will play in the production setup. Workers are kept fully informed as to business conditions by the plant's enlightened management

the pressure on technical training

program—a plan to save the island from literal starvation by attracting industry from the United States.

Puerto Rico could offer American industry two prime inducements: (1) 10 years' exemption from all corporate income taxes, and (2) a desperately-eager-for-work people who asked then, as now, for very small wages by U S standards.

But these same willing, inexpensive workers were almost without exception completely untrained in the skills that incoming industries would need. There were, for instance, practically no tool and die men, no top-grade machinists, and few trained production workers to be found on the island.

The problem in the words of Teodor Moscosco, founder and head of the "Fomento" program: "Fundamentally we have to create jobs faster than our population increases the labor force." But jobs could only be created by training people to do them—a sort of "which comes first, the chicken or the egg?" setup.

Puerto Rico, then, was faced with the job of not only training green farmhands for factory jobs, but with the longer-range problem of preparing its people to become engineers, technicians, supervisors, and managers. To do it, the Commonwealth's government took a leaf out of the United States' vocational training manuals—and added a few ideas of its own.

Two things particularly have given Puerto Rico's training programs terrific impetus. First is an intensely industry-conscious government, which considers vocational training a top priority project in the island's economic survival. Second is the magnificent cooperation between American industry on the island and the people who run the vocational training system.

UNMATCHED TRAINING INTENSITY

Industrial training in Puerto Rico is thus intensified and concentrated to a degree matched perhaps by no other area in the world. Its scope includes everything from basic training of farm people for production work to engineering training at the college level. And everywhere along the line, American industry plays a vital role.

For example, there's the production worker training program at Caribe General Electric in Palmer, some 25 miles outside San Juan. Here, the training of "green" workers is second to none in the world. It represents a joint effort between Puerto Rico's "Fomento" program

4 . . . what it makes . . .
Here, the assembly section supervisor shows the trainee the type of switch she will assemble, is told how it is used in a household "front entrance" electrical system

Training in Puerto Rico . . .

5 . . . how it's made . . .

Transparent overlays of breakaway drawings of an assembly are shown to the trainees. Each sheet is lifted slowly, to give the girls time to understand the principle

6 . . . who makes what . . .

Accepted applicants, before they start intensive training, are personally conducted on a tour of the Caribe G E plant by General Manager James E Whittenton. Here a machine's operation is explained to the girls, most of whom have never seen production equipment and lines at work

and General Electric's management.

Prospective employees for Caribe G E are chosen from applicants in the plant's primarily agricultural neighborhood (see the picture story running through these pages), who are carefully screened by the Puerto Rican Employment Service. Most likely applicants are then re-screened by the company's Puerto Rican personnel manager.

Finger dexterity tests are given, and general mechanical aptitude of the applicant is checked. Those who qualify go through a complete physical examination by the plant's doctor. By this point, the applicant is sure to be hired.

Next, the new worker is thoroughly oriented into the relationship of his or her job to the operation of the plant as a whole. (Caribe GE makes industrial circuit breakers and household electrical devices).

Then the new employee's sectional-supervisor-to-be, himself a Puerto Rican, takes over. Along with four or five other new workers, the girl moves into the training room. Here is a large table, upon which are the complete components of the switch or part the trainee will eventually assemble in her daily work. The supervisor, with aid of an assembly section leader, carefully shows the girls, step-by-step and very slowly, how to assemble the part. For this purpose, cellophane-overlay breakaway drawings are lifted one at a time to show how each component fits into the whole assembly. Too, housings for the part are of transparent plastic instead of the usual metal—so that the trainee can better visualize the finished assembly.

This procedure may take as much as four hours before each trainee has put together a complete assembly, but by the time the class has finished, the supervisor knows which girl is most adept. Jobs are awarded accordingly, the most apt trainee gets the first job, the next best the second job, and so on down the line.

Then comes the training "wrinkle" for which Caribe GE is famous—so much so, in fact, that when Puerto Rico's Governor Luis Munoz Marin first visited the plant he insisted on seeing first what he termed "the most important single room in all Puerto Rico."

The trainees are seated around a large rectangular table, which is equipped with bins of parts for assembly. At one end of the room is a movie screen. A film of the assembly operation the trainees are to perform is run, first at normal speed, then in slow motion. It is repeated over and over.

The girls begin to look in the bins for parts similar to those being shown on the screen. Watching the hands in the film, they pick up one part, fit it to another. After hours, sometimes even days, one girl will squeal delightedly, beam all over. She's assembled a part all by herself. The other girls look at her enviously, but soon another and still another completes the assembly—then all of them.

For a day or two, under the supervision of the training director and the section leader, the girls continue to make assemblies—by now without the help of either the film or breakaway drawings.

The trainees move out into the

7 . . . and how to become a topnotch production worker

This is Caribe GE's famous training system at work. A class of five girls, under supervision of their assembly-section-leader-to-be (standing) learn assembly methods by watching a film on screen at rear—first at normal speeds, then in slow motion—until each trainee can perform the assembly herself. This process, the most important in the training sequence, is done with infinite care, never hurried

shop and take their places at a regular conveyor bench. From here on out, they'll work together as an actual assembly section. Caribe GE has found this works better than scattering the class to assembly sections all over the shop. The trainees by now are no longer strangers to each other. Each has had more or less the same experience as her classmates and doesn't feel self-conscious, as she might if put in with more experienced workers.

For a day or so, the girls assemble components by handing parts from one to other down the line, and the section leader at the end inspects them. Then the conveyor is started slowly, and almost imperceptibly is speeded up from day to day until the girl's reach the plant's standard of production—usually within a week or two.

That is worker training at its most basic—the teaching of industrial skills to a people more familiar with the snick of the machete than with the hum of machines. But what about the training of skilled and semi-skilled metalworkers—machine operators, tool and diemakers, even engineers, supervisors and management people?

Puerto Rico has found the answer to that, too. But first look at the raw materials of the island's industrial training—its people.

ABOUT PUERTO RICANS

It has been said that Puerto Ricans have two assets that make them invaluable as production line workers —an extremely easygoing temperament, and the lack of a manual "groove." By the latter it's meant that Puerto Ricans have no industrial tradition behind them, that they don't have to unlearn the movements of their last factory job before becoming proficient in the new one.

But it's been said, too, that this very lack of an industrial history militates against the Puerto Rican when it comes to acquiring more complex skills, or in qualifying for engineering and supervisory positions.

This theory is no longer as widely held as it once was, now that Puerto Rico has had a decade or so of intense industrialization, during which more and more of the native population has had a chance to come up through the ranks, or has been trained in high schools and vocational schools for skilled metalworking.

Puerto Rico is unique among Latin American countries in that it can rely upon the United States as a training ground for industry. What with commuting between the island and the US mainland a common thing, most Puerto Rican families have at least one member working in the States. The Puerto Rican who has two or three years of U S factory experience under his belt finds a ready market for his services when he returns, often in a minor supervisory capacity.

Under the Fomento program, the Commonwealth will often foot half the bill to send Puerto Ricans for training to the mainland home plant of a U S-owned Puerto Rican subsidiary.

Puerto Rico's trade and industrial education program has been in ef-

Training in Puerto Rico . . .

Island-trained workers . . . like this milling machine operator at Monitor Industries, Hato Rey, P R, are today capable of performing highly skilled metalworking jobs—thanks to intensive government training programs backed by U S industry's cooperation

fect since 1931, and since then has grown from 167 students to nearly 20,000 a year. Vocational training at the high school level is so designed as to give the student a general education, as well as training in a specific trade.

At the end of three years, the student gets a high school diploma and a vocational certificate. If he works in his trade for at least a year after graduation, the student gets a certificate of occupational proficiency.

Schooling is free, so are necessary shop work clothes, and a needy student can get a "Transportation Scholarship," which pays his way to and from school.

BI-LINGUAL STUDENTS

The full-fledged vocational school student is required to take two years of both English and Spanish, and advanced general mathematics, in addition to shop. Necessary related instruction is given by the shop teacher as part of the shop class.

The machine shop student, for instance, is required to spend varying amounts of time on bench work, drill presses, lathes, shapers and planers, milling machines, grinders, and a course in welding is optional.

A tool and diemaking course is offered to those students who have taken the machine shop course. They learn to make several different types of dies, also take such related subjects as mechanical drawing, die design, and operation of machines used in tool and diemaking. Required units of study include bench work, lathe, shaper, milling machine, surface grinder, polisher, drill press, diemaking, and tool and die mounting and testing. Upon graduation, the student is qualified as a skilled worker in the tool and die industry.

Metalworking, too, can draw upon students who have completed the course in Aircraft and Engine Mechanics, which includes use of hand tools, basic bench work, technical drawing, welding and machine shop practice in addition to its more specialized aviation training.

The Puerto Rican vocational system also trains draftsmen, diesel and automotive mechanics, electric motor repairmen, and ornamental iron workers, all of whom have acquired some skills applicable to metalworking plants.

ONE YEAR COURSES, TOO

The Short Duration Program, designed to meet demand for specialized workers in industry, lasts just about a year, produces workers with less broad general knowledge of metalworking, but who can meet worker requirements of a specific industry. These are short-term students, not regular high school students. They must be 18 years old by the time they complete their training, which is concentrated upon one or two particular phases of machine shop (such as lathe and milling machine operation) for three to six hours a day. At the end of a year they are qualified machine operators.

Then there's Puerto Rico's Trade Extension Program, designed to meet the needs of expanding industries or those new to the island. Under this program, training is given by vocational schools in industrial fields that offer good job possibilities. In other words, if an electronics firm moves into, say, the San Juan area, the company can get in touch with the local vocational school and arrange to have students trained in its particular line of work—the idea being, of course, that the firm will hire the students upon completion of training.

Alternatively, employees of the company can take courses under vocational school guidance to either upgrade themselves in their work, or to prepare for new jobs in the event that the company switches over to a new product or process. Such training is given mostly in the evening under vocational school supervisors at the school, or in the plant itself with company people supervising the training. Some 5162 workers from industry, including apprentices, took advantage of part-time trade extension last year.

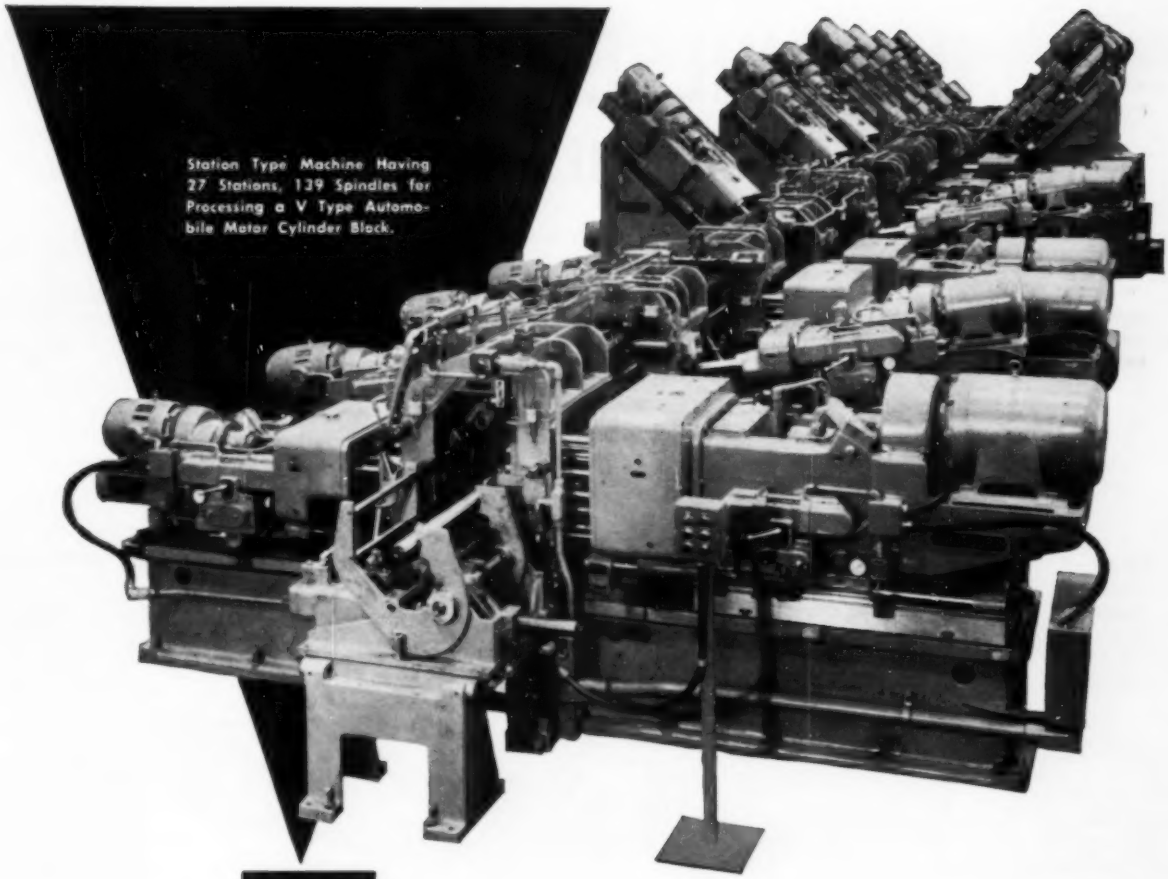
More than 200 registered apprentices from industry have gone in for part-time trade extension, taking related information courses in such fields as machine shop, diesel mechanics, power sewing machine mechanics, tool and diemaking, foundry and boilermaking, knitting machine and seamless hosiery machine mechanics.

OVER 5000 VETS IN TRAINING

Trade and industrial training in Puerto Rico is extended to cover its U S Army veterans. Some 5219 of them are enrolled in 12 vocational schools across the island, and another 1209 are on the waiting list. Machine shop is already a major course, one for veterans in tool and diemaking is being organized, and courses in electronics are being contemplated. In short, the Commonwealth Board for Vocational Education isn't wasting time on needless courses. Its curriculum is geared to the needs of incoming and existing industry. The task is monumental in the face of rapid and diversified economic expansion of an island that a few decades ago was based almost solely upon a one-crop economy.

SHOWCASE FOR LATIN AMERICA

Courses in engineering are being offered today at the University of Puerto Rico which are the envy of all Latin America. In fact, under the Point Four program, Puerto Rico has trained and is training students from all of South America, other Caribbean islands, and Europe. For this is the island where American technical training methods are being funneled out to the world—methods brought to such a high point that their creators, the Americans themselves, might do well to take advantage of the bread they once cast upon the waters of the Caribbean—it is today returning a thousandfold.



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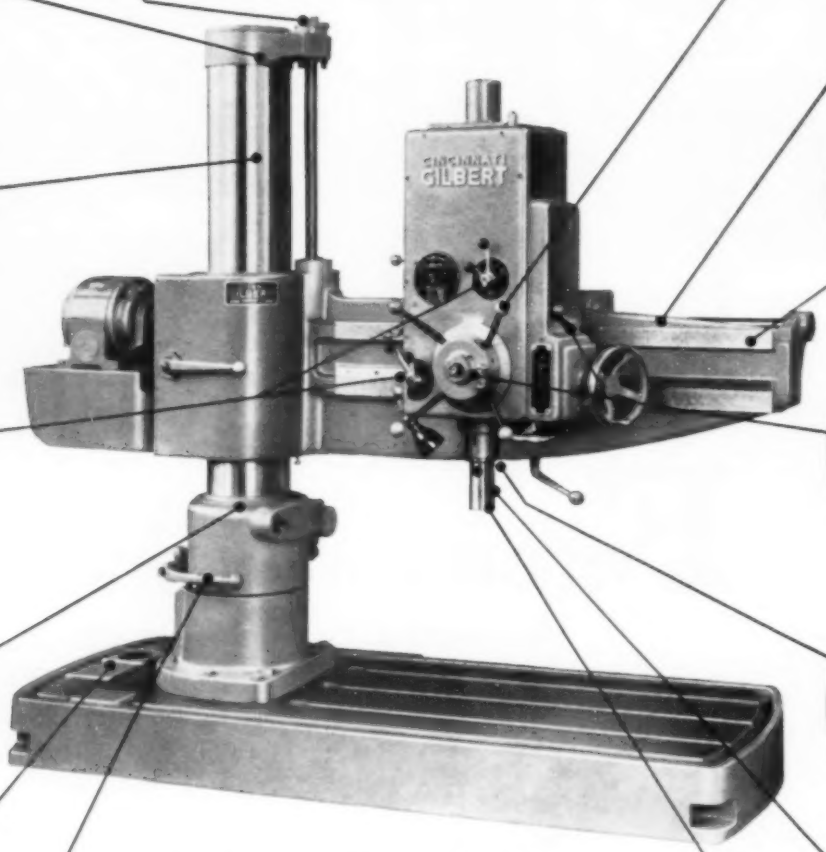

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3366 BEEKMAN STREET, CINCINNATI 23, OHIO

Fusion Welding of Titanium—IV

JOINT DESIGNS

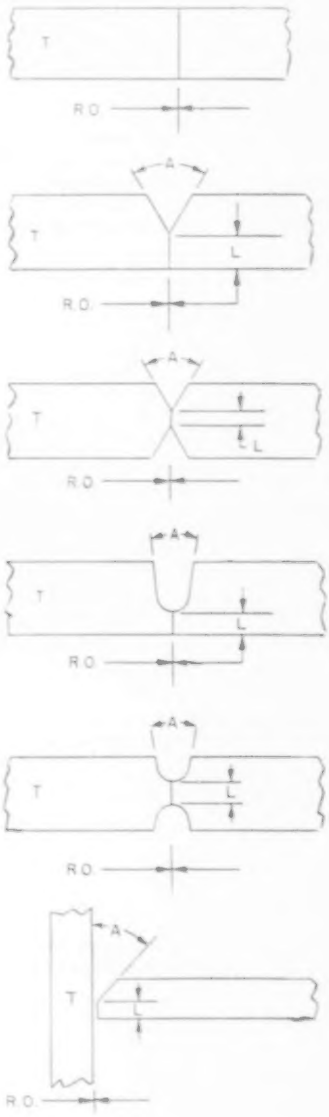
The joint designs used for welding titanium are similar to those used for other metals. A typical selection of joint types is shown in Table 2. The square-butt joint is most common for gages in the 0.010 to 0.062 in. range for tungsten-arc welding without filler material. In certain cases of excellent joint fit-up the range might be extended to 0.125 in. Generally, however, undercutting of the weld bead presents a problem for gages above 0.090 in. Therefore, at the 0.125 in. gage, the optimum joint would be designed to have a slight root opening for tungsten-arc welding with filler wire.

The single-V joint may be

Table 2—Joint Design for Titanium Welds

TYPE	Thickness In.	Weld† Passes	Electrode‡ Type	Electrode Dia	Filler Wire Dia	Root Opening (R. O.)	Bevel Angle A	Land L
Square Butt	0.010-0.62	S	T[1]	1/16	None	0	—	—
	0.031-0.125	S or D[2]	T	1/16	None	0	—	—
	0.031-0.125	S	T	1/16-⅛	1/32-1/16	0-0.10T[3]	—	—
Single V	0.062-0.125	S	T	1/16-3/32	1/16	0-0.10T	30°-60°	0.10-0.25T
	0.125-0.250	First	T	1/16-3/32	None	0-0.10T	30°-60°	0.10-0.25T
		Second	T	1/16-3/32	3/64-1/16	—	—	—
	0.125-0.500	First	T	3/32-⅛	None	0-0.10T	30°-90°	0.10-0.25T
		Second	C	1/16	—	—	—	—
	0.125-0.500	S-M	C	1/16	—	0-0.10T	30°-90°	0.10-0.25T
Double V	0.250-0.500	D	T	1/16-3/32	1/16	0-0.10T	30°-90°	0.10-0.25T
	0.250-0.750	D	C	1/16	—	0-0.10T	30°-90°	0.10-0.25T
	0.750-1.500	D-M	T	1/16	—	0-0.10T	30°-90°	0.10-0.25T
Single U	0.250-0.500	First	T	1/16-3/32	1/16	0-0.10T	15°-30°	0.10-0.25T
		Second	T	1/16-3/32	1/16	—	—	—
	0.250-0.750	First	T	1/16	None	0-0.10T	15°-30°	0.10-0.25T
		Second	C	1/16	—	—	—	—
	0.250-1.000	Multiple	C	1/16	—	0-0.10T	15°-30°	0.10-0.25T
Double U	0.750-1.500	D-M	T	1/16-3/32	1/16	0-0.10T	15°-30°	0.10-0.25T
	0.750-1.500	D-F	T	1/16	None	0-0.10T	15°-30°	0.10-0.25T
		D-M	C	1/16	—	—	—	—
	0.750-2.000	D-M	C	1/16	—	0-0.10T	15°-30°	0.10-0.25T
Fillet	0.031-0.125	S or D	T	1/16	None-1/16	0-0.10T	0°-45°	0-0.25T
	0.125-0.500	S or D	T	1/16-3/32	1/16	0-0.10T	30°-45°	0.10-0.25T
	0.250-1.000	S or D	C	1/16	—	0-0.10T	30°-45°	0.10-0.25T

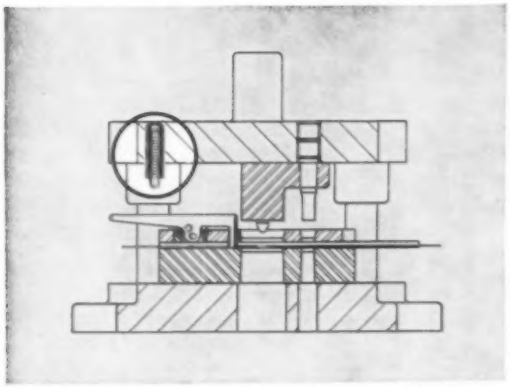
[1] Thoriated tungsten electrodes. † S = Single; D = Double ‡ T = Tungsten; C = Consumable
[2] Double pass: 1 pass each side.
[3] T = thickness of base material.



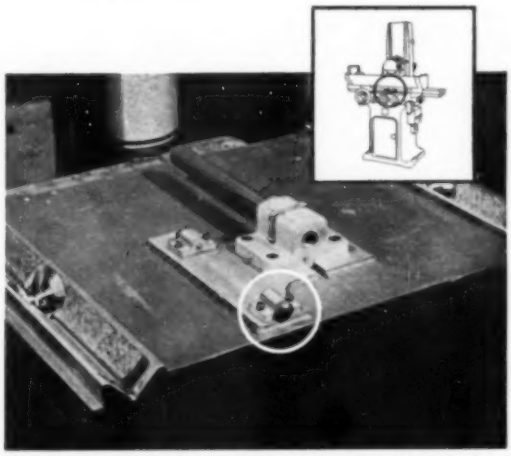
Practical Tooling Tips

Number 2 of a series.

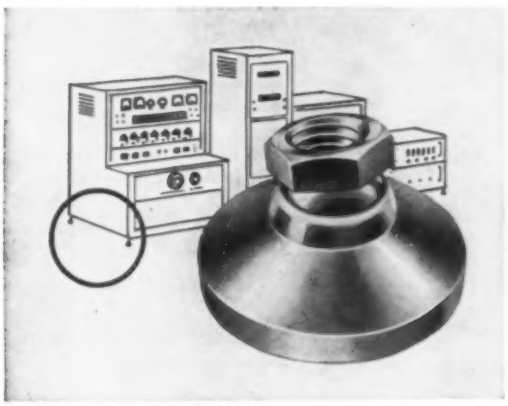
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

TO GET NEW IDEAS on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

New catalog now ready! Send for your copy today.

Insist on Vlier Tooling Accessories ... there's still no substitute for quality!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Fusion Welding of Titanium—V

welded with the tungsten-arc process using filler wire, or the consumable-electrode process. In either case, it may be desirable to use a closed-root joint with a land and weld an initial root pass using the tungsten arc without filler. The remainder of the weld can then be made in one or more passes, depending on the thickness of the material, using either tungsten-arc welding with side-wire filler or the consumable-electrode process.

PREPARATION OF WELD SURFACES

Sheared or sawed edges and the surfaces of sheet, plate or tubing should be thoroughly cleaned in the area of at least 1 in. from the joint on both sides before welding. De-burring should be done with a sharp file. The use of sandpaper or steel wool to de-burr or clean surfaces and edges is not good practice.

If the material is received in scale-free condition, it may be necessary only to clean the surfaces with methanol alcohol or acetone, or any commercial solvent that leaves no residue. Once the surfaces are cleaned they should be kept free of fingerprints.

Solvent cleaning will not remove surface oxide produced during mild forming operations at slightly elevated temperatures. In these cases, two good methods have been used successfully.

In an acid pickle, the joint areas are dipped in 5% hydrofluoric acid—40% nitric acid for 1 to 15 min and rinsed in cold running water, then rinsed in hot water to facilitate drying.

The other method is to wire brush the joint areas with a stainless steel brush.

Heavy scale must be removed by blasting, or with molten caustic baths. Molten bath treatments require precautions to control the bath temperature and immersion time to minimize the possibility of hydrogen pick-up. After removal of the heavy scale, the foregoing acid bath should be employed to remove any residue and improve the surface appearance.

JOINT FIT-UP

It is difficult to produce good welds, especially in light gage (0.100 in. or less) sheet material, without having good joint fit-up.

With the edges properly prepared the next important feature of good joint fit-up is clamping. Tacking of a long seam weld every few inches to prevent a joint from moving is common practice on many materials, but it is not recommended when welding titanium. The tacks will usually contain some contamination which will be further fused into the weld.

(Continued on page 119)

Table 3—Typical Weld Settings for "Open Air" Machine Welding

	Tungsten Arc Without Filler			Tungsten Arc With Filler			Consumable Electrode			
Gage, in.	0.030	0.060	0.090	0.060	0.090	0.125	0.125	0.250	0.500	0.625
Electrode Dia	1/16	1/16	1/16–3/32	1/16	1/16–3/32	3/32–⅛	1/16	1/16	1/16	1/16
Filler Wire Dia	—	—	—	1/16	1/16	1/16	—	—	—	—
Wire Feed Rate, Ipm	—	—	—	22	22	20	200-225	300-320	375-400	400-425
Voltage	10	10	12	10	12	12	20	30	40	45
Amperes	25-30	90-100	190-200	120-130	200-210	220-230	250-260	300-320	340-360	350-370
Nozzle ID	9/16–⅝	9/16–⅝	⅝–¾	9/16–⅝	⅝–¾	⅝–¾	¾–1	¾–1	¾–1	¾–1
Primary Shield, cfh	15A	15A	20A	15A	20A	20A	50A + 15H	50A + 15H	50A + 15H	50A + 15H
Trailing Shield, cfh	20A	30A	50A	40A	50A	50A	50A	50A	60A	60A
Back-up Shield, cfh	4H	4H	5H	5H	6H	6H	30H	50H	60H	60H
Back-up Material	Cu or Steel	Cu or Steel	Cu or Steel	Cu or Steel	Cu or Steel	Cu or Steel	Cu	Cu	Cu	Cu
Back-up Groove, In.	¼x1/16	¼x1/16	⅜x1/16–3/16x1/16	¼x1/16	⅜x1/16–3/16x1/16	⅜x1/16–3/16x1/16	⅜x1/16–3/16x1/16	½x⅛–¼x1/16	⅝x⅛–¼x1/16	⅝x⅛–¼x1/16
Electrode Travel, Ipm	10	10	10	12	12	10	15	15	15	15
Power Supply	DCSP	DCSP	DCSP	DCSP	DCSP	DCSP	DCRP	DCRP	DCRP	DCRP

Interstate Drop Forge Company—

20 Years a Cities Service Customer and Still Forging Ahead!

The modern way to cut a die is typified by die sinking machine, one of many at Interstate Drop Forge Company. All die sinking machines are lubricated by Cities Service lubricants.

With production running at roughly 1000 tons per month, Interstate Drop Forge Company of Milwaukee is one of the largest forging concerns in the Wisconsin area and growing all the time.

An integral part of this growth story, Cities Service is proud to have filled Interstate's lubrication needs for the past 20 years.

Drop hammers . . . helve hammers . . . upsetters . . . forging rolls . . . shapers . . . automatic metal saws. These are but a few of the diversified machines lubricated by specially tailored Cities Service oils and greases.

Actually, in a plant of this type with so many differing pieces of machinery, it would be possible to have as many as 25 different lubricants. But, Interstate, with the aid of their Cities Service Lubrication Engineer has been able to standardize on twelve Cities Service lubricants.

Streamlining . . . standardizing . . . improving. These are some of the services a Cities Service Lubrication Engineer can render for your operation, too. Ask him to make a free lubrication survey of your plant. Call the nearest Cities Service office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

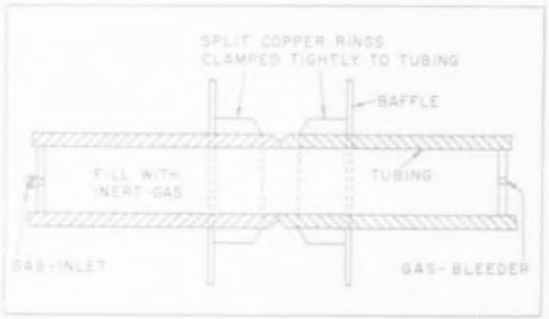
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Fusion Welding of Titanium—VI

Table 4—Stress-Relief Treatments

Grade	Temperature F	Time at Temp.
Commercially	800	8 hrs
Pure	900	45 min
	1000	30 min
Ti-5A1-2.5Sn	900	20 hrs
	1000	6 hrs
	1100	2 hrs
	1200	1 hr
Ti-6A1-4V	900	20 hrs
Annealed	1000	2 hrs
	1100	1 hr
Ti-6A1-4V	900	15 hrs
Solution-treated	1000	4 hrs
Ti-6A1-4V		
Solution-treated	900	15 hrs
and aged	1000	5 hrs



Butt welding of tubing requires a special setup. In addition to chill clamps and a shield, the ends of the tubing should be sealed off and the interior purged with inert gas, which is then maintained at slight pressure

ARC LENGTH

In all cases, the arc length should be the minimum attainable with respect to the joint configuration, filler-wire size and electrode diameter. With semi-automatic and automatic tungsten-arc equipment, arc lengths can be adjusted at the optimum height above the weld joint. Although this optimum height will be dependent upon the gage of the material being welded, joint design, and filler-wire size, the setting will generally be about 1½ times the electrode diameter. When filler wire is not being used, the maximum arc length should be about equal to the electrode diameter.

RECOMMENDED SETTINGS

Typical settings for welding titanium with and without filler are listed in Table 3. These settings are for semi-automatic or automatic arc-welding equipment with back-up bar, trailing shield and hold-down shoes. Settings for manual welding are similar. When a trailing shield is not used with manual welding, the arc gas flow should be increased 60-100%. It also may be desirable to weld at a slower speed, in which case the amperage must be reduced proportionately. If no back-up or chill bar is used, the current must be reduced approximately 20% to avoid burn-through.

MULTIPLE WELD PASSES

The possibility of weld contamination increases with each pass. Some shops prefer making several passes using very low heat input each time to avoid excessive grain growth, while others prefer a minimum number of passes to avoid excessive contamination. In any event, the cooling rate of the weld can be controlled somewhat by the proper choice of back-up support material and chill bars. When welding heavy plate sections, sounder welds can be obtained by depositing more metal per pass to reduce the number of passes required. There is some evidence that porosity can be eliminated by using multiple weld passes.

STRESS RELIEVING

Proper stress relieving is important to avoid weld cracking from the build-up of high residual stresses. Because of the narrow spread between yield and ultimate strength, residual stresses caused by welding will not be compensated for by local or general permanent set of the stressed areas.

The data in Table 4 were obtained from laboratory bend relaxation studies. It can be seen that minimum stress-relieving temperatures of 1000 to 1200 F are required for practical short-time stress relief operations.

BRIGHTENING DIP

After the stress-relief anneal, the furnace discoloration may be removed by brightening in a 2% HF-20% HNO_3 bath at 160 F.

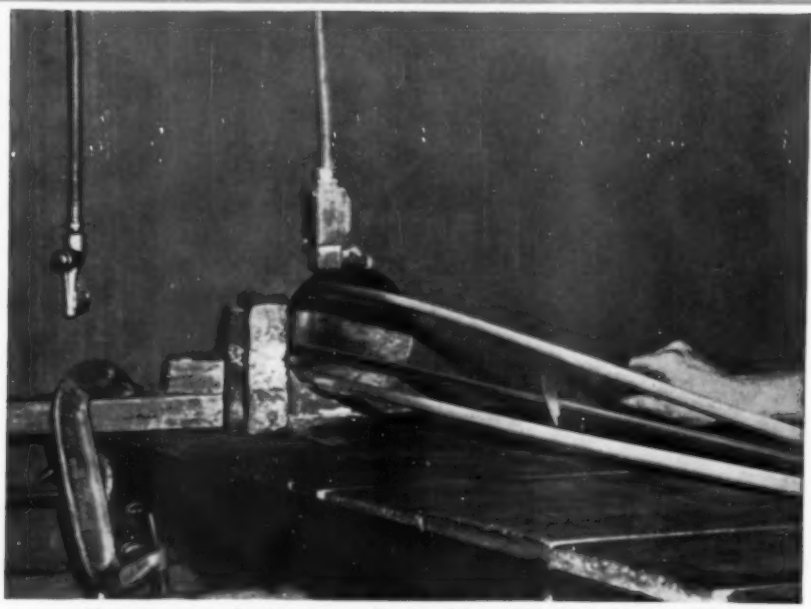
Local stress relief can be accomplished by gas-torch heating of the weld area to approximately 1200 F (cherry red) and air cooling. To avoid the possibility of hydrogen contamination, the gas flame should be slightly oxidizing.

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Showing extrusions leaving the press. The die of Cromo-WV tool steel is not visible.

Die made from Cromo-WV passes tough extrusion test

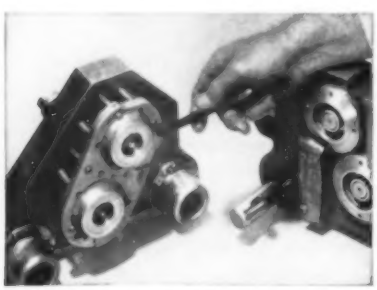
Quality plus economy — that's the kind of a die steel they needed at American Aluminum Extruders, Miami, Fla., to produce aluminum extrusions used as decorative trim. Our local tool steel distributor, J. M. Tull Metal & Supply Co., Inc., recommended Bethlehem Cromo-WV.

"We've had a lot of experience with this grade," they said. "Give it a try, and the performance figures will speak for themselves."

That's just the way it turned out. Cromo-WV was satisfactory in every way. Hardened to Rockwell C-47, the die extruded about 2,500 lb of aluminum before polishing was required.

Cromo-WV, in addition to its 5 pct chrome, contains .30 pct vanadium. It is a modification of our popular Cromo-W, the original 5 pct chrome hot-work steel. Like Cromo-W, it combines red hardness, shock resistance, and resistance to heat-checking. It is an ideal grade for extrusion work.

Your Bethlehem tool steel distributor will be pleased to supply Cromo-WV, whether you want a production quantity or just enough to give it a trial.



IT'S TOPS FOR BOTTLE CAPS

Here's a die made of BTR (Bethlehem Tool Room) which was used in producing millions of tinplate bottle caps. The die was hardened to Rockwell C-61, and was redressed about every third month. BTR is our general-purpose manganese-chromium-tungsten grade of oil-hardening tool steel. Tough, and safe-hardening, you can count on it for extremely long wear.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

In Machining Operations, Chips Tell a Story

A good way to evaluate a machining operation is to examine the chips carefully. This step is particularly valuable in operations where large amounts of metal are removed at high speed.

Generally, the color and shape of the chips tell a story which, when properly interpreted, can lead to improvements in the operation. For example, when machining with high-speed steel tools, the chips produced should show some temper color (yellow or brown). If they do not, it means that speed and feed might be increased greatly, boosting the production rate on the machine. When machining with carbide or ceramic tools, the chips should always be highly temper-colored (purple or blue). If otherwise, you are probably "under-machining."

The shape of the chips will vary with the type of steel being machined, but comparison of chip shape under varying conditions may provide valuable information. The ideal chip shape, indicating ideal machining conditions, is like the letter "C." Often the "C" can have a decided flourish, but this form of chip (on steel) is best. Generally, the secret of producing "C" chips lies in the proper balance of feed and depth of cut, versus speed. These factors should be varied whenever other types of chips are produced, to develop the best machining conditions.

Examination of chip shape is also of value for control purposes. For example, if "C" chips are being produced in a machining operation, and they become gradually longer or stringy, it indicates the tool is becoming dull, and requires resharpening.

It is difficult to establish more specific rules which apply to all machining operations, due to their variety and complexity. However, you can be sure that the proper control of chip color and shape will pay off in increased production.

Talking Shop...

Vended Scholar

ALMOST ANYTHING can be found in vending machines today. Even education. At Flick-Rudy Corp in Melrose Park, Ill, the vending machines in the plant are operated by an Employees' Benefit Fund. The profits have been used for a variety of employee recreational programs. Now the committee (elected by the men in the shop) that handles the fund has started to set aside a share of the profits for a scholarship program. Contribution to date: $1100. Now the company's salesmen have asked to share in contributions to the fund.

Change Order

THAT VANGUARD rocket that successfully put a satellite in orbit last month included a St Christopher medal (patron saint of travelers) wired to the base of the gyroscope package. The modification was the idea of Paul Lipinski of the Martin Co who initiated a drawing change request which went through the customary dozen approvals. Reason for the change was given as "addition of Divine guidance." According to the change order for the wiring of the medal to the second stage, "no additional charges will be made for engineering, manufacturing, installation, processing, etc."

File Reclamation

AT VICKERS-ARMSTRONG (Aircraft) Ltd, a process has been developed to reclaim used files. A worn file is placed in a bath of 56% sulfuric acid and a voltage is applied (8 v, 100 amp, for a 10-in. file). Electrolytic action causes a preferential erosion of the flank of the file teeth, forming a fresh cutting edge. Heavy milling cut files are said to be reclaimed up to seven times.

Calling All Cars

AN UNUSUAL FRAUD is reported in a warning to the Machinery Dealers National Association. Two men appeared at a dealer's plant in Ohio in February. They gave their names as C M Barnes and Chas Morris and offered to buy a centerless grinder (No. 2 Cincinnati, Serial No. 2M2H1K-1174). The dealer refused their personal check. Two days later they returned with a check written on a check-writing machine and bearing a red certified stamp. The men loaded the machine into an old dump truck which, "as its most distinguishing feature, lacked a tailgate." As you've probably guessed, both the check and the certification turned out to be fraudulent. The check was on yellow paper and drawn on The Lorain Banking Co, Lorain, Ohio (which has used blue checks since 1943.) A fraud of this type is rare but difficult to detect. It looks like a couple of auto thieves are branching out.

Tolerance Warning

"WEAPONS BUILT for speeds of Mach 3 to 4 will very likely use steel for their aerodynamic surfaces. Therefore, excessive tolerances on skin material can result in a staggering increase in weight. It would be possible for a bomber having 2000 sq ft of wing area to increase its weight by approximately 5000 lb if the skin material were on the high side of the tolerance. This could mean a 50,000 lb increase in weapon weight to cover the extra power plant, fuel and structure required to fly the additional 5000 lb." Boyd Bucey of Boeing said that at a recent conference in Southampton, England.

MEMOS

by BESS RITTER

During the Civil War, Confederate machinists were not only exempted from the draft, but could command fantastic fees of $20 daily because it was so important to maintain machinery needed to carry on the war and build new apparatus. Machinists who insisted on getting into the war were classified as gunsmiths and immediately made sergeants.

Original name for nickel was "kupfer-Nickel," meaning "Old Nick's copper," because the Saxony miners who first discovered it in the 1740's believed that it was copper that had been cursed by the devil.

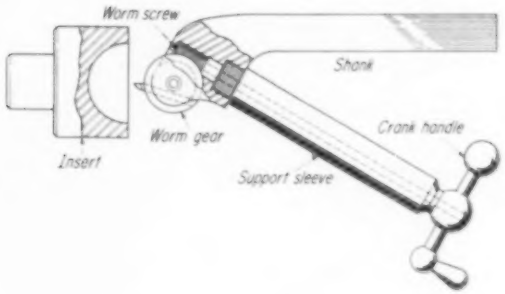
This conclusion was arrived at because although the vein was similar in appearance to copper, the ore wouldn't smelt and couldn't be hammered into tools. The deposits were considered useless until a Swedish scientist, Cronstedt, eventually determined that nickel was a separate metal.

When Chicago was young, it was discovered that the Tremont Hotel had been built on a mudhole and was rapidly sinking. While the owners and their engineers debated how to go about the task of elevating this 200 ft long, four-story building without disturbing the guests, who were, by this time, climbing up to the street from the lobby by a flight of wooden stairs, a 27-year-old unknown machinist came to the rescue.

He placed 5000 jacks at regular intervals and hired men to man them. At given signals, this young machinist, named George M Pullman, who later invented the sleeping car, raised the building a half jackturn at a time until it was once more level with the sidewalk.

Practical Ideas...

Worm-Gear Arrangement Rotates Radius Cutter



A mold we were recently constructing called for a series of semi-spherical impressions. Normally, a hob would have been made to produce the cavities in inserts, but the material from which they were to be made was not suitable for hobbing.

Each insert, therefore, had to be completely machined in the lathe. This posed the problem of getting a true radius in the cavity. It was too large for a forming tool, and too small for our available concave-radius turning equipment.

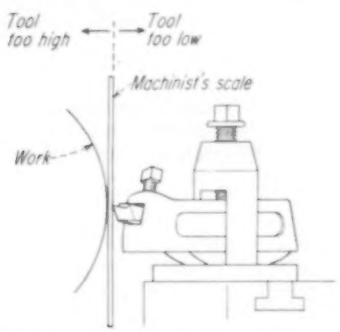
Our only solution was to construct a tool that would do the job. The above sketch shows the worm-gear arrangement we devised to complete the cavities efficiently. It has since proved to be a valuable piece of equipment for any job having a radius, either spherical or annular.

The tool body was first made because it would later serve as the fixture in hobbing the worm gear. A slot was milled across the end of the body to receive the worm gear. The worm-screw hole was then bored at the same level, and was tapped to accept the worm-support sleeve. The hole for the worm-gear axle was located so the gear would properly engage the screw.

Machining the worm gear was like turning a sheave for a pulley, but with close adherence to thickness and diameter dimensions. The groove radius was turned with a forming tool to match the root diameter of the worm screw. The gear teeth were hobbed by rotating a tap of the same diameter and thread pitch as the worm screw into the groove of the gear blank. This was done by mounting the tap on centers in the lathe and driving it with a dog, while the gear blank was held in the tool body and fed into the tap.

After the screw had been machined to mesh with the gear, a toolbit hole was drilled in the gear. We used a 3/16-in.-dia carbide which was held with a small setscrew. All parts were then assembled, and a crank handle was fitted to the end of the screw.

F C Ashton, Liverpool, England



Scale Indicates Tool Position

The location of the tool is always of prime importance in turning. Guesswork, as to its height in relation to the center of the work, is seldom an effective approach.

The method I use to find my tool height is simple; and it does away with gages or other more cumbersome methods. I just pinch my 6-in. scale between the work and the toolbit, but no tighter than it takes to keep the scale from dropping through.

If the scale stands vertical, the toolbit point is on center. If the scale leans towards the work, the toolbit is too high; and if it leans towards the toolpost, the tool is too low.

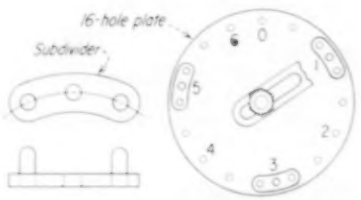
Buckley Sullivan, Shaker Hts, Ohio

Subdivider Provides Intermediate Dividing-Plate Holes

We had a job on which 256 divisions were required. This could not be effected with the dividing plates supplied with the head, because a rotation of 5 holes on a 32-hole plate was necessary to produce one division.

Rather than going to the trouble of making a new plate containing 32 holes, we fabricated the simple subdivider shown. Employed on a standard 16-hole plate, it supplies an intermediate hole for every second indexing.

The subdivider is a small plate with three equally spaced holes.

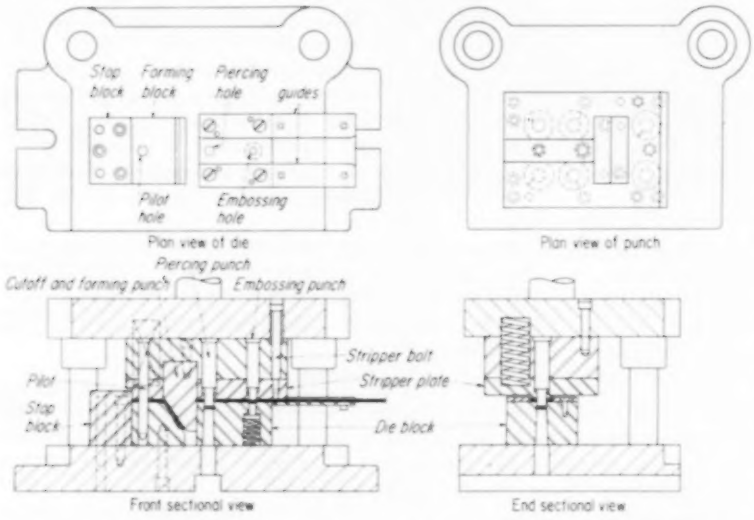


The two end holes are drilled at the same spacing as the 16 holes on the plate, and the center hole at the same radius. Pins are then pressed into the end holes to serve as locators. They should slip fit into the plate holes.

Indexing is carried out as follows: Beginning at location 0, (see sketch) the first cut is made. Location 1 is equal to 5/32 holes, or 2½ on the 16-hole circle, and requires the subdivider. The sketch of the plate shows the subdivider in its first three locations. From then on, every uneven numbered location calls for the subdivider.

M Barash, Prestwich, Lancs, England

Die Produces Parts Without Scrap Loss



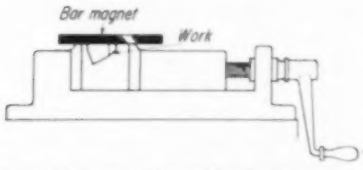
Illustrated is a high production die that pierces, embosses, cuts off, and bends strip metal into clips. A unique feature of the die is that there is no cutoff scrap. One complete part is produced with each stroke of the press, eliminating repositioning and rehandling. Then too, the die is designed so that finger stops are not needed.

The stock, from which the parts are made, is 12 gage (0.104 in.) C R steel, and is fed through the die from right to left between fixed guides. The first piece is pierced and embossed by allowing the stock to project slightly over the cutoff edge. From then on the stock is inserted all the way through to the stop block.

A spring-loaded stripped plate grips the stock before any of the punches make contact. Spring plunger in the embossing cavity ejects the strip on the upstroke of the press, allowing the strip to advance to the forming section of the die.

To insure accuracy, the pilot is made long enough to enter the work before cutoff is made. The combination cutoff and forming punch then cuts the clip to length and folds it over the form block. This block is relieved to clear the embossing. Inclining the press permits the finished parts to fall out into a container at the back of the press.

Roger Isetts, Kenosha, Wis



Bar Magnet Speeds Setup

When small parts must be gripped in a milling vise, it is sometimes difficult to hold them in a desired position while the vise is tightened. This is especially true when they are so small that there is no room for fingers between the vise jaws, or when the parts are shaped to exclude all use of parallels.

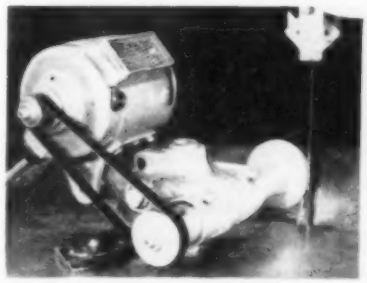
A bar magnet, applied as shown in the sketch, makes work positioning easy when I have to machine such parts. Instead of gripping a workpiece directly in the vise, it is attached to a bar magnet and inverted between the jaws.

With the magnet bridging the jaws the vise is tightened and the magnet is removed. Should it be necessary to have the workpiece raised, small matching parallels are first placed on the jaws.

To make the end of a piece square with the top, the same method is used allowing the piece to extend outside the jaws for machinery. A piece of equal width is then placed at the other end of the jaws to prevent their springing.

Before this method can be used, the top of the vise jaws must be checked for parallelism with the bottom of the vise. If correction is necessary, a small piece of stock is gripped in the vise to apply strain, and the jaws are ground to equal heights. The contact face of the bar magnet must, of course, be perfectly straight.

Donald A DeSpain, Cleveland, Ohio



Old Bandsaw Blades Ground to Cut Rubber

When you have to cut thick rubber into shapes for die buffers and other parts, a bandsaw blade ground to a knife edge does a fast and clean job.

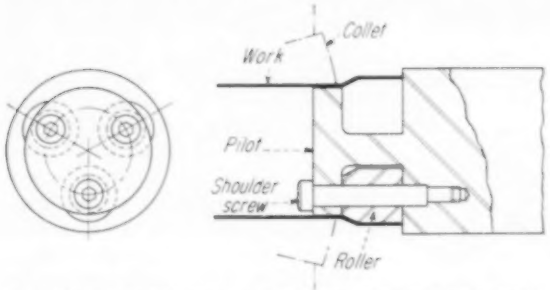
Selecting an old blade, one that is no longer useful for metalcutting, we insert it in the bandsaw as usual. A toolpost-grinder is then mounted on the saw table to remove the set in the teeth and also to produce a slight bevel.

I usually bevel only one side of the blade, but both sides can be ground if desired. As much of the serrations as possible should be left intact; they seem to improve cutting speed.

H J Gerber, Stillwater, Okla

Practical Ideas...

Production Setup Utilizes Roller–Expansion Tool



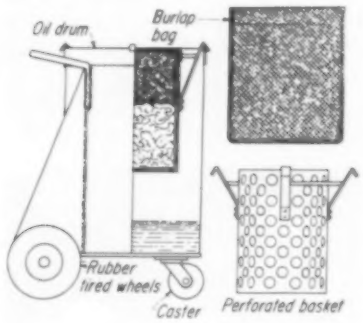
The illustrated tool was initially designed and built to effect a saving in tooling on a small job order. Additional savings were later realized when several thousands of the same parts were ordered.

The job was to expand one end of brass-filler tubes. Their OD was 2 in. with a wall thickness of 0.049 in., and each piece 24 in. long. It was decided to run the job in our turret lathe, gripping the work in a 2-in. collet. The shank of the tool was turned to fit one of the stations in the turret.

A pilot was turned on the forward end of the tool body to loosely fit inside the tubes. Following the pilot were three equally spaced rollers fitted into a wide groove. These rollers were made from tool steel, and were hardened and ground. Standard socket-head shoulder screws served as axles for the rollers.

In use, the tubes were pushed through the machine spindle to a stop and gripped in the collet. With the work rotating, the roller tool was entered into the tube end and advanced until stopped by the shoulder on the tool.

Roger Isetts, Kenosha, Wis



Grinding Sludge Disposed of in One-Way Burlap Bags

The sludge, created during extensive grinding, long presented a disposal problem in our plant. After a period of from 10 days to 2 weeks, we would have more than a dozen drums loaded for disposal and would then have to call a private scavenger.

This service cost money, and because the drums had to be returned we were charged for two trips, making this service doubly expensive. Replacing damaged drums, caused by rough handling and corrosion, was also costly. Another objectionable feature was the odor that the sludge would give off after a few days' exposure during hot summer months.

All these objections were eliminated by the construction of two carts like the one illustrated. A standard drum was provided with a pair of rubber-tired wheels, a caster, and a handle bar for easy transportation. The perforated basket was made of aluminum to resist corrosion, and equipped with hooks for suspension inside the drum. The cross bars between the hooks provided a more convenient access to the basket.

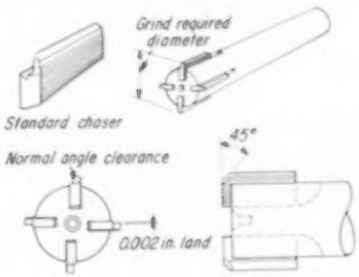
An inexpensive burlap bag was secured inside the basket to collect the metallic and abrasive particles of the sludge, while allowing the coolant to drain off. At the beginning of each day, when the coolant had almost completely left the sludge, the bag with its content was removed. After the bag was tied up it was thrown in with our daily rubbish and disposed of by our regular scavenger service.

Thus, a lot of floor space was saved and the major cost of upkeep was that of the bags which were only a few cents apiece. The coolant, separated from the sludge, was sumped out of the drum.

Stanley Murzyn, Chicago, Ill

Special Reamers Utilize Thread Chaser "Shorts"

The die head is used extensively in some shops for cutting threads because of its long life. But once the chasers have outlived their usefulness as die-head cutters, there is at least 2/3 of the chaser length left. We have made good use of scrap chasers by converting them into a variety of special tools.



One of these is an off-size reamer. Other tools we have made the same way are form tools and seating tools. All are equally simple to construct. The body or shank of the tool is the same in each case; the difference is only in the shape of the cutting edge.

For the sake of maintaining concentricity, the shank is indicated and centerdrilled in both ends. Four slots, which will receive the chasers, are then milled at one end 90° apart. The width of the slots should be the same as the thickness of the chasers, minus half depth of the thread serrations.

As the chasers are carefully aligned and pressed into the shank from the open end of the slots, they cut their own seatings, enough to hold them securely. Mounted on centers, the tool is ground to the job requirements.

George Wilkes, Castlereagh, Belfast, Ireland

CLIFFORD MOLLOY
Bronx, NY

won $25 in addition to regular payment for his idea:

CROSSLIDE DEPTH STOP HAS MANY POSITIONS

in the Jan 13, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

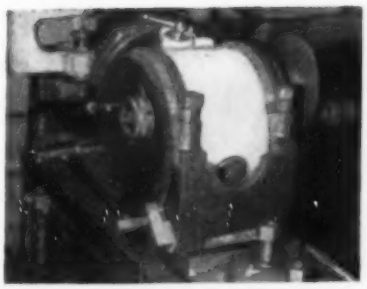
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Gear Teeth On Side Plate Aid Dividing-Head Adjustments

The photo above illustrates a feature we have incorporated on all our universal dividing heads. It makes angle adjustments easy when a head is loaded with a heavy workpiece. And secondly, but just as important, it prevents accidents when locking screws are loosened.

Gear teeth are cut on the periphery of the side plate after it has been removed from the dividing head. A pinion is then made to match the teeth on the plate. The pinion shaft is either milled square or hexagonal to suit an available wrench or handle. An angle bracket, secured to the side of the head, holds the pinion in mesh with the plate.

Now, when angular settings have to be changed, the locking screws can safely be loosened and the pinion rotated to make the shift.

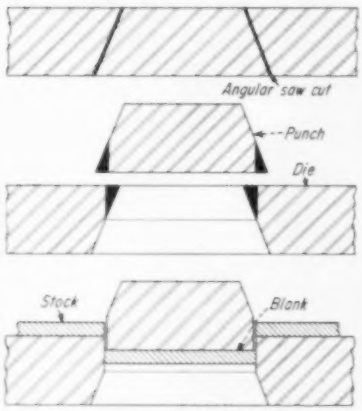
Frank Kelleher, West Lynn, Mass

Angular Saw Cut Saves Material

Recently, when we were about to construct a blanking die, we found ourselves short on material. The available piece was large enough for the die section, but the punch material was lacking. That's when we reached into our bag of tricks and came up with the illustrated idea.

By carefully sawing out our die opening at an angle, we knew we could utilize the scrap piece for the punch. Deciding on a 25° angle, we laid out a circle on the working surface so the cut would intersect the required diameter midway through the block.

A few small holes were first drilled along the scribed line at the correct angle. The resulting slot was then cleaned out to permit the entry of the saw blade. Tilting the saw table to 25°, we carefully sawed out the plug as shown in the sectional view at the top of the illustration.



The second view shows the metal removed in boring the blank diameter of the die and also how much is taken off in turning the punch. Here's proof that with a round blanking die you can eliminate waste and still have a die with plenty of stock left for many resharpenings.

F A Adams, Dayton, Ohio

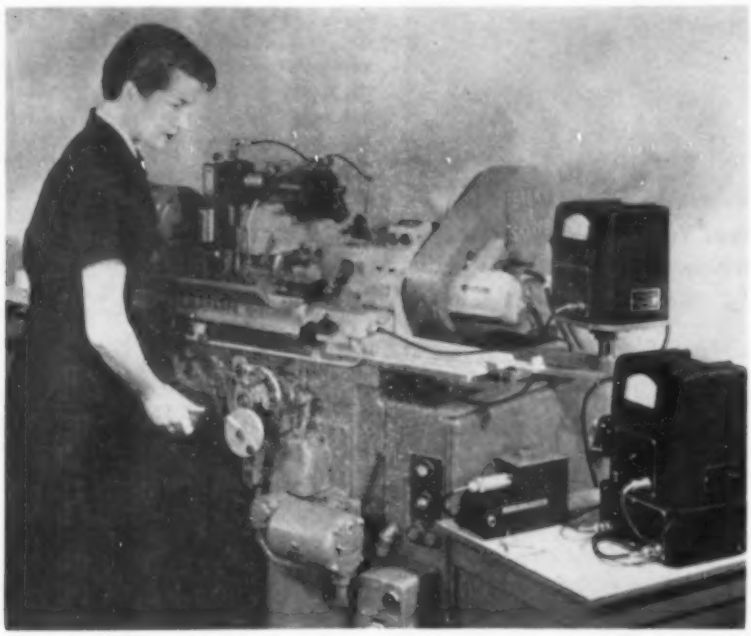
Expansion Bit Cuts Gaskets

Whenever we need a small ring gasket we cut it with a carpenter's expansion bit. If the bit has a square shank and if you want to preserve it, a carpenter's brace will be necessary to rotate the bit. Otherwise, the square is cut off and the rest of the shank is chucked in a drillpress and rotated by hand.

Before any cutting is done, the gasket material is tacked to a board inside and outside of the proposed circles. The outside diameter is cut through the material first to insure concentricity. Entering the pilot into the same center, the inside diameter is cut after the bit has been readjusted.

E Mayover, Bradenton, Fla

New Shop Equipment



Instrumentation on a Plain Grinder Mates Parts to ± 20 Millionths

Ten years ago a New England machine tool builder produced a refined plain grinder that would grind a fuel-injector piston to ± 20 millionths. The part needed no lapping, but the operator had to be expert.

Now, by development of further instrumentation, a semi-skilled operator can:

1. Plunge grind suitable parts to any predetermined size within ± 10 millionths.

2. Plunge grind suitable parts to any predetermined fit in a group of mating holes within ± 20 millionths, without making individual measurements and calculations, and even though the holes may vary in size by 0.0002 in.

3. Perform fitting or finishing operations on a group of similar parts, removing as little as 10 millionths stock or up to 0.0002 in. from each piece within an accuracy of ± 10 millionths. Once the setup is made, the amount of stock removed from each part can be varied within the above limits, depending upon individual part requirements.

4. Parts may be taken from the machine, measured, and replaced in the machine where as little as 10 millionths can be removed from the diameter.

Machine Applications

The advanced grinding technique is suitable for fuel-injection systems, missile components, and the like, where geometrical accuracy and a finish of 2 to 3 mu-in. are required. In addition to eliminating a lapping operation, the process will open up size tolerances for bores, because pistons and plungers can be ground to mate with bores to a predetermined clearance without selective fitting.

To attain super-accurate external grinding of pistons or the mating of parts, two essentials must be realized: (1) an accurate machine and (2) advanced instrumentation.

The machine, a No. 5 plain grinder, has been reworked to 0-0 alignment, to remove any inherent inaccuracy in the vertical and transverse directions. To avoid taper effect, the swivel table is set exactly with an Electralign instrument on a bracket at the right end of the machine. Carbide centers are lapped to 60° point angle and truly round; the taper shank is made exactly concentric with the point. Three-point support on spring isolation mounts reduces the effect of external vibration upon machine accuracy. Coolant is filtered and maintained 2 deg above room temperature by a cooling device. These refinements produce a grinder that is able to plunge grind within ± 10 millionths for size, straightness and roundness.

Instrumentation

Instrumentation now ready for the market consists of:

- An electronic caliper gage having three carbide-tipped contacts that ride on the workpiece. Two of these contacts are adjustable, so that work from 3/16 to 1 in. dia can be handled.
- An electronic amplifier that magnifies the caliper reading and indicates the results in 0.000010 in. increments.
- An "Electromate" attachment, which is available when it is desired to grind pistons to mate with bores within precise clearance limits. The Electromate consists of a computer-selector unit on which the amplifier is mounted and a bore gage which can be provided with suitable measuring points for bores from 3/16 to 1 in.

With the Electromate, it is possible by means of the selector switches to indicate on the amplifier: (1) diameter of work being ground, (2) hole size in workpiece on bore gage, in comparison with a master, and (3) the actual difference in size of the part being ground and the hole in the workpiece on the bore gage.

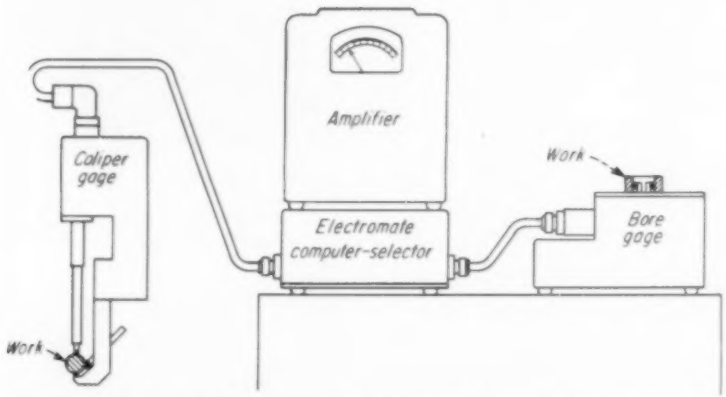
When used together, these three units are electronically coupled. Selector switches provide flexibility for various precision grinding applications. All the instruments can be recalibrated.

Ceda/Size Control

The heart of the entire setup is the "Ceda/Size" control. The operator is shown with her hand on the Ceda/Size control lever, which produces an extremely fine cross feed —in millionths per work revolution.

Suppose we are grinding a piston

Materials and Parts



MEASURING POINTS in both the work-riding Caliper Gage of the "Ceda/Size" and the Bore Gage of the "Electromate" can easily be replaced and the units completely recalibrated in the field by the machine operator. There is no need to return these units to the factory

to a predetermined size. Here are the steps:

1. Straightness of grinding is checked by grinding a test piece, using the Electralign.

2. A precise sample, or a master of the exact mean diameter, is set between centers. The electronic caliper gage is placed on the master, the headstock is run at work speed, and coolant is applied. The knurled knob on the caliper is turned until the amplifier reads zero.

3. If parts have carefully lapped centers and come to the Ceda/Size grinder within 0.0002 to 0.0003 in. of size, the automatic cycle and spark timing features are not required. The wheel is advanced until the amplifier reads within about 0.000050 in. of size. At this point the Ceda/Size lever is depressed until the amplifier reads zero. Now the work is within 0.000010 in. of size and is round and straight.

Procedures for mating pistons to bores are:

Method A—To grind a piston to mate with a given cylinder body to specified clearance:

1. Place cylinder body on bore gage.

2. Set desired clearance into differential setting circuit of the Electromate. Selector switches provide steps in increments from 0.0001 to 0.00001 in.

3. Place workpiece (piston) between centers.

4. Grind piston until indicator is at zero and work will be within the established clearance.

Method B—To grind pistons to specified clearance with respect to a master:

1. Set a ring gage of predetermined size on bore gage. Repeat steps 2 to 4 above.

Brown & Sharpe Mfg. Co, Providence 1, Rhode Island

1000-amp Electrolytic Power Unit Offered for Production Grinding

Electronic electrolytic power supply unit with output capacity of 1000 amps is designed for large volume work such as surface and cylindrical grinding where wheels from one to three inches wide are used and there is large contact area between wheel and work.

Unit, which acts as both the power and control source for electrolytic grinding, incorporates two control features. It sets the max voltage and current to proper level for max removal, depending upon characteristics of material being ground. In addition, it automatically senses sparking between wheel and work in order to eliminate such sparking and arcing before it becomes harmful.

Equipment may be attached to any good quality grinder now in use. Details of necessary steps for conversion are available from manufacturer. Literature available.

Anocut Engineering Co, 631 W Washington Blvd, Chicago 6, Ill

including...

MACHINE TOOLS AND ATTACHMENTS

Precision Grinder 126
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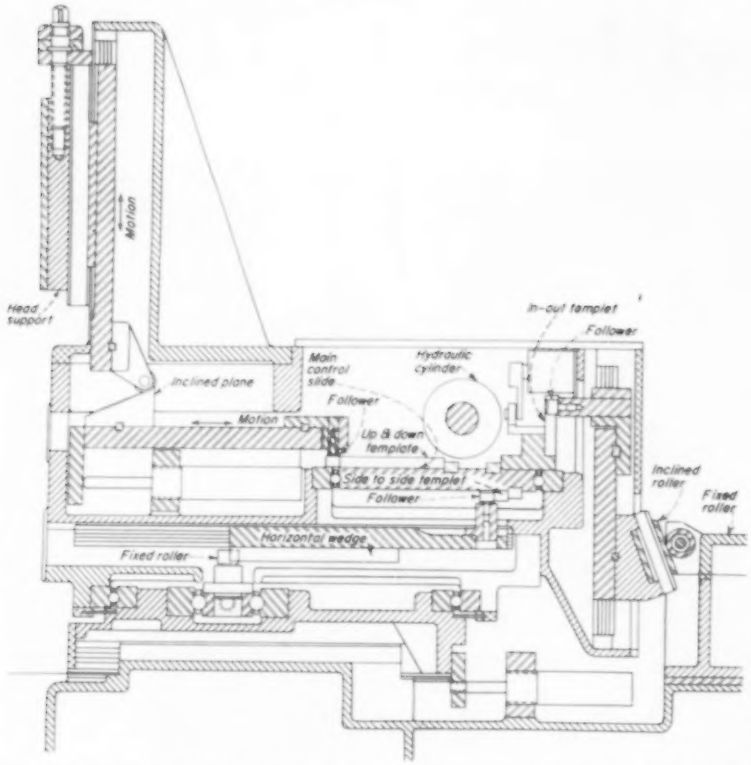
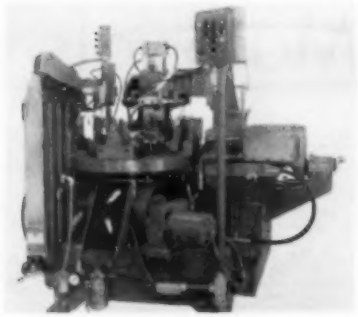
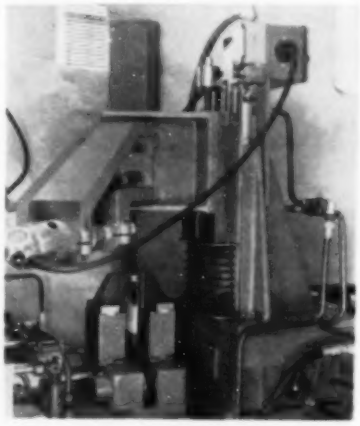


TEMPLETS CONTROL HEAD MOTION as main slide is powered (toward you) by hydraulic cylinder. Up-down templet moves follower horizontally, but motion is transferred to vertical by an inclined plane. In-out templet moves follower up and down, but motion is transferred to in-out by inclined roller at the right. Side motion is controlled by horizontal templet under main slide; horizontal wedge transfers motion to necessary direction



MACHINE IS LOADED at gravity track (upper left), indexes work to two milling heads (rear and right), and finally releases work to discharge chute



SMALL MILLING CUTTERS in air-powered spindles chamfer blade-root corners to complex contour determined by christmas-tree or similar root shape

Three-Dimensional Contour Miller Chamfers Jet-Engine Blade Roots

Based on the ideas behind a precision grinding-wheel dresser (Hoglund) and incorporating new (patent-pending) principles, a mechanized twin-head indexing milling machine is replacing tedious hand burring and chamfering operations on turbine blades. In an 18-sec cycle, the unit contours four corners of each blade root accurate to 0.001 in. The miller will meet tolerances as close as 0.0002 in., if necessary, working from precision templets with strictly mechanical mechanisms, except for electrical control switches.

Blades are loaded into a slanted track that feeds them down to a load position. Electrical interlock controls here stop the machine if a blade is warped, canted, or loaded backward. Pickoff fingers lift the blade, centering it by means of a justifying linkage, and load it between clamp jaws of a table fixture. Four fixtures index past the load station, two twin milling heads, and an ejection station. The rotary table indexes only after all necessary mechanical motions have been completed at all stations. Safety interlocks also include a check of each fixture clamp to make sure completed parts have been dropped to the ejection chute.

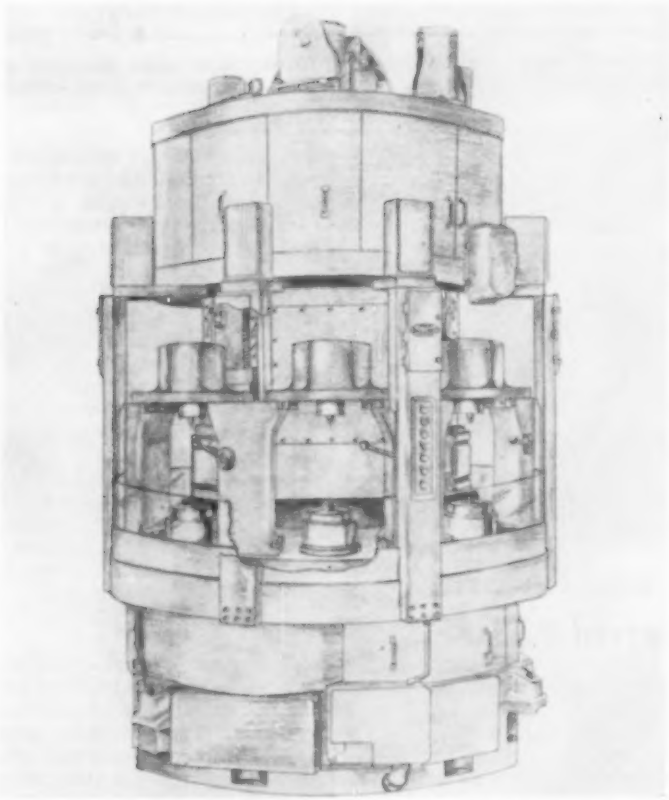
Cam Control

Each of the two working heads has two air-powered spindles with small cutters angled to chamfer the blade roots; one station does the front corners, the other the rear corners. Each head is also equipped with three templets to control motions in all directions. A ball-bearing slide behind each head traverses past all three templets, which operate followers to transfer motion to the head at a preset ratio; anything from 2:1 to 10:1, depending on work size and shape. The slide is powered hydraulically against weight of the head when moving in one direction; an independent hydraulic cylinder lowers the head on the return stroke.

Motions are transferred from the templets to the head via inclined planes that incorporate the necessary dimension ratios. In-out motion is transferred through two contacting rollers, one slanted against the other, which allow constant in-out control as the main slide traverses. Vertical motion comes from a horizontal templet that traverses against a roller; the roller moves in and out, and transfers this motion to vertical by means of an inclined roller. A hydraulic cylinder moves the templet slide against back pressure caused by the weight of the machine head.

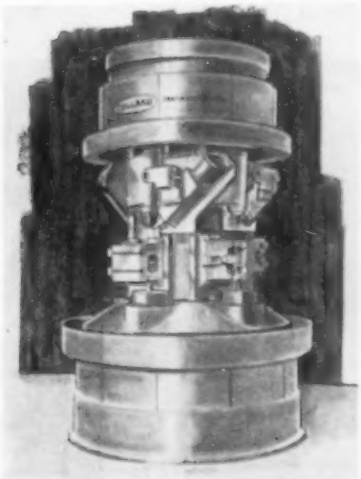
Depending on blade-root geometry, the milling spindles may be tooled at different angles and the templets and inclined planes may be changed for different jobs.

Tri-Ordinate Corp, Hoglund Engineering & Mfg Co, Berkeley Heights, NJ



MULT-AU-MATIC gives selective feeds and speeds at each station. Speeds range from 56 to 1000 rpm. There are 81 feed-change possibilities. Fully automatic, feed is by leadscrew rather than by cam

Bullard Designs for Flexibility In Turning and Grinding



CONTIN-U-MATIC four-spindle machine has hydraulic feeds on all heads. Each head permits choice of coarse or fine feed—with automatic feed and speed change

Three machines being readied at Bullard typify the "new look" in machine-tool design by providing not only greater power and speed, plus a larger choice of feeds, but flexibility of assembly. Thus, machine components can be selected and arranged to provide the capacity needed by a customer, as well as efficient tool arrangement.

One design is the Contin-U-Matic machine equipped for contour turning. This four-spindle, high-speed vertical machine provides a tailstock at each working station, a tracer-controlled head to the right of each station, and a turning, cross-feeding, or special-purpose head to the left of each station. Hydraulic feeds are used on all of the heads instead of cams.

Tooling is minimized, as compared with earlier models, by the universal design. Each spindle is supplied with two speeds, to suit the job, changeable in the cut. Each head permits a choice of coarse or fine feed—with automatic feed and speed change.

A new center-turning Mult-Au-Matic six-spindle machine is being used to produce steering knuckles at the rate of one piece every 8½ sec. Each of the five working stations (the sixth station is for loading) is equipped with a heavy-duty hydraulic tailstock, a spindle, contour-turning heads (direct templet, not tracer), cross-feeding heads. Selective speeds and feeds, for optimum cutting, are available at each working station. Speeds range from 56 to 1000 rpm in 49 steps. Feed-change possibilities number 81. The machine cycle is fully automatic and feeding is by leadscrew rather than cam. Up to 100 hp is available, as is hydraulic chucking if desired.

3-D Contour Grinder

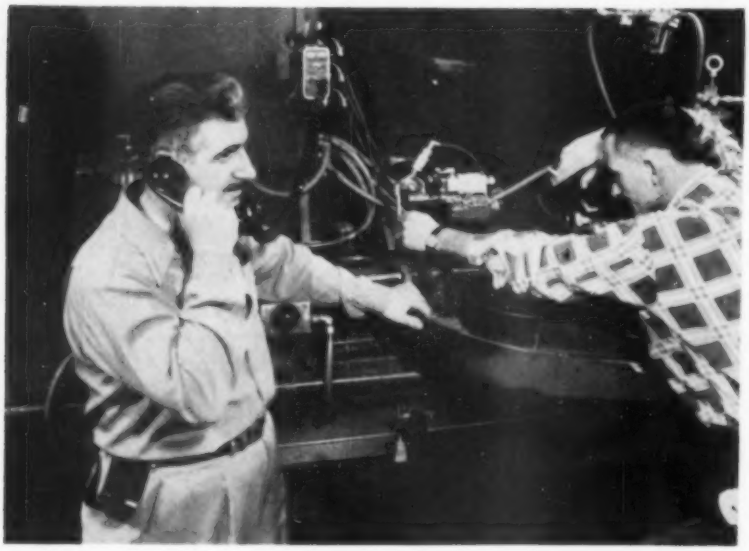
Still another design is the vertical chucking grinder for contour grinding. This application is believed to be the first time a double dimension contour control device has been used on a grinder to control both the horizontal and the vertical motion of the head, which is mounted on the crossrail.

A second, single-dimension contour device geared to the swivel maintains the grinding wheel tangent to any irregular surface being ground. The 3-D effect is now obtained with cams, but the system lends itself to numerical control. The removable grinding head can be replaced with a tool post for conventional contour turning. If necessary, a side head is available for grinding special shapes into the profile.

This machine will be available with capacities from 26 to 76 in. in increments of 10 in. and in any desired height. Heads from 3 to 10 hp will provide speeds of 5000 sfpm or more. Table speed is adjustable to suit the best grinding condition. This grinder, wholly controlled from a pendant, will maintain surface speed at a predetermined constant during grinding. Wheel dressing is automatic.

One consideration in designing for flexibility is the increased interest in using machine tools as part of an integrated, automated line. Thus, both the Contin-U-Matic and the Mult-Au-Matic can be equipped with work-loading and unloading devices suited to the nature of the part being worked.

The Bullard Co, 286 Canfield Avenue, Bridgeport 2, Conn



Control System Directs and Records All Production From Central Point

Lower manufacturing costs and greater productive efficiency result from a new system which displays instantly in a central dispatch room happenings at every machine in the shop. This equipment links every piece of productive machinery by electrical wires to a central production monitor in the dispatch room. Up-to-the-minute production data are provided in visual form for production-control personnel.

Wherever parts are manufactured this electromechanical system, named the Hancock Telecontrol, can monitor, for control, the entire production process, stage by stage, throughout each shift. It tells at a glance how much is being produced, where, and at what cost. At the same time, in easily visible form, supervisors may learn of emergencies occurring in the plant which require immediate attention, while the system routinely records incoming production data on registers for later use.

Within a Telecontrol installation, supervisors work in a central dispatch room. This "nerve center" includes one monitor cabinet and as many control cabinets as are needed. (Every group of 20 production machines requires one control package.)

Each machine, or each sub-assembly line, has a control box that permits the machine operator to signal the dispatch room. This box has two lights, a switch, a reset button, a lock, and a telephone jack. Both lights are duplicated on each of the control cabinet's twenty display panels. In normal production, only the green light is on. When an operator needs help, he signals by pushing an "alarm" switch, and a red light flashes in the dispatch room. At the same time, an audible "beep" warns the dispatcher to direct the foreman, by public-address system, to the machine requiring attention.

Upon arrival, the foreman diagnoses the trouble. If the operator requires more parts or materials, or wants finished work taken away, the foreman plugs a special telephone handset, which he always carries, into the control box and asks the dispatcher to send the stock man. Thus, no operator loses productive time by leaving his machine and ceasing work.

If the trouble is mechanical and requires repair, the foreman requests the dispatcher to send a maintenance man. The foreman may then transfer the operator from a productive rate to "downtime" status by inserting a personal key into the control box. This key turns the red light on continuously both at the machine box and on the monitor. This shows the dispatcher which machines are inoperative and which workers are on downtime and can be reassigned.

If repair is time-consuming, the foreman assigns the operator to another machine already set-up for production. In the past year, the system has reduced downtime at the Hancock plant by over 50%.

Display Panels

Each display panel on the control cabinet, in addition to red and green lights, carries four electromechanical registers. These devices represent productive time, downtime, number of parts produced within the shift, and the balance of the unfinished order. As long as the green light is on, the productive register shows the time elapsed, and the "parts" register indicates the pieces produced, while the balance register subtracts an equal number of parts. Whenever a foreman turns his key and the red light goes on, the productive-time register stops and downtime is indicated on the unpro-

CONTROL CABINET DISPLAY PANEL carries a particular machine's job ticket. Each display panel becomes "live" at start of shift when operator's plug is inserted, as shown

Hollow Mill Maker finds

DBL-2
High Speed Steel

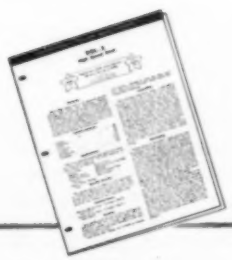
HARD, TOUGH and VERSATILE

The maker of these adjustable hollow mills required a steel that would give top performance in a variety of jobs—turning, tapering, facing, chamfering and trepanning. After thorough testing, Allegheny Ludlum's high speed DBL-2 was selected.

DBL-2 is an improved general-purpose high speed steel. It contains tungsten, molybdenum and vanadium in such proportions that it excels 18-4-1 for most applications. DBL-2's unusual combination of high hardness with toughness, its ability to hold a fine grain over a wide hardening range, and the fact that it easily machines many diverse types of stock, made it particularly well suited for this job.

In addition to these advantages, DBL-2 can be heat treated in the same furnaces and atmospheres as 18-4-1 without fear of harmful decarburization. These DBL-2 blades were heated to 2250 F., oil quenched and drawn twice at 1025 F. After heat treatment, blades easily machined such stock as aluminum, stainless steel, carbon steel, aircraft steel, plastics, bronze, screw stock, cast iron and brass.

There is an A-L tool steel to meet your toughest requirements. For further information call your A-L representative or distributor today, or write . . . .
Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.



Write for
BLUE SHEET on DBL-2

Gives all needed handling and shop treatment details on DBL-2. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc.

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ductive-time register in fractions of hours. As soon as the balance register reaches the total of parts to be made, the green light begins to flash and a "beep" warns the dispatcher that the order is complete.

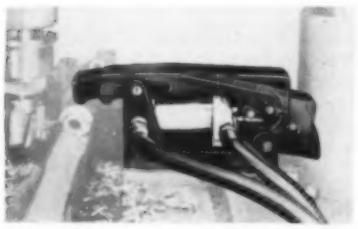
The display panel for a machine won't work until the dispatcher inserts a small plug marked with the operator's number, showing the machine is manned. As the shift starts, a master time clock in the plant closes the circuit and actuates the Telecontrol system—the green light goes on at the control cabinets as well as on the machine control boxes, showing operators they may begin production.

At end of each shift, dispatchers transfer all production statistics to a five-channel tape add-punch machine so that each of the other departments, such as accounting, planning, purchasing, production, and engineering may instantly compute its requirements and the day's production data from the punched tape.

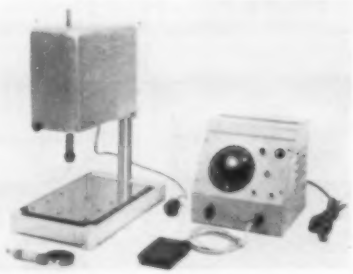
The prototype Telecontrol system has been in full operation for over a year. In its capacity as an automatic work registration system, the equipment has saved Hancock nearly $100,000—$80,000 saved in nonproductive payroll—in that the 16 men formerly required were transferred to other functions, and the dispatch room is now manned by two managers. In downtime, over $20,000 was saved in one year.

With 200 machines connected to a Telecontrol, cost per machine controlled is in the region of $250. For a lesser number of machines, cost per machine increases slightly. In plants having more than 200 machines, one additional monitor is required for every 200 pieces of equipment, while a single control cabinet is needed for every group of twenty machines.

Control Systems Co, Div of Hancock Industries, Jackson, Mich



HEAVY-DUTY CLAMP delivers 10 times the line pressure and is cam-locked in event of air failure. This automatic, air-operated device is 3 in. wide, 3⅝ in. high and 8¼ in. long—*Lodding, Inc, Worcester, Mass*

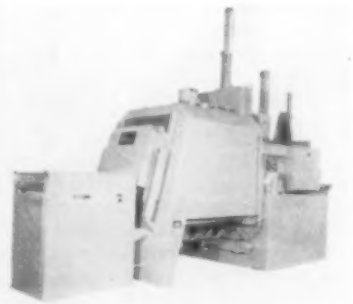


Leadscrew Tapping Machine Is Multiple Pitch, Automatic

Automatic tapping cycle is actuated by footswitch or pushbutton. In an automatic manufacturing process where the operator is replaced by suitable workhandling equipment, cycle can be actuated by the work itself when it is positioned properly under the tap.

Tap is fed into and retracted from work at a controlled rate governed by a master leadscrew. Machine uses only one master precision leadscrew yet it covers the entire range of standard pitches from 32 through 80 threads per inch in tap sizes No. 0 through No. 10. Changeover from one pitch to another is accomplished in about 90 seconds. Adjustable friction clutch is incorporated in the design to allow precise control of torque delivered to the tap. Tap stroke is adjustable from ⅛ to 2 in. and tapping speed is infinitely variable. Cycle time, depending upon pitch and stroke, can be as high as 3000 cycles per hr.

Milman Engineering Co, 1831 Pontius Ave, Los Angeles 25, Calif

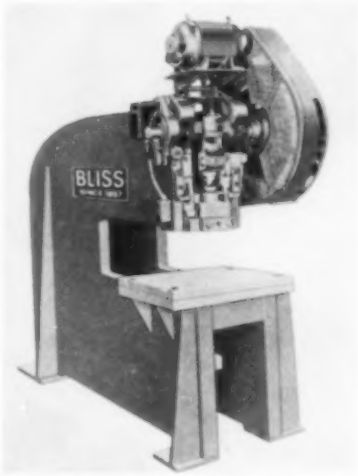


Ipsen Heat Treating Furnaces Offer Many New Features

Model B straight-through heat treating units have been redesigned to provide many new and improved features. New features include quiet gas burners which operate without tail flames; 100% air-gas premix system; super-alloyed ceramic heating tubes; one-piece-cast fan and shaft assemblies; improved door sealing; and a redesigned refractory arch for increased strength.

Cooling capacity of the quench units has been increased by use of multiple-finned cooling tubes. Accessory equipment includes semi-automatic or automatic loaders, automatic washer and dryer equipment, draw furnaces and atmosphere generators.

Ipsen Industries, Inc, 721 S Main St, Rockford, Ill



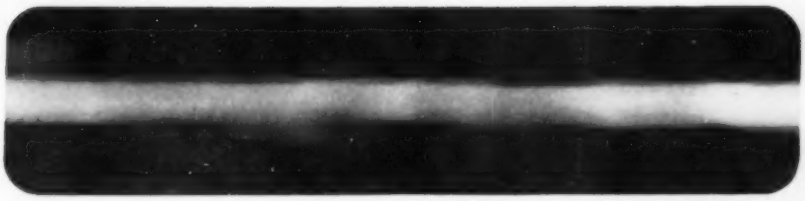
Deep Throat Presses Offer High-Speed, Wide-Sheet Stamping

New line of deep throat presses, designed for high-speed punching, cutting and forming on large, wide sheets, includes two bench models of 4- and 7-ton capacities and six floor models ranging in capacity from 10 to 60 tons. All offer complete parts interchangeability with Bliss bench and inclinable presses of similar tonnage.

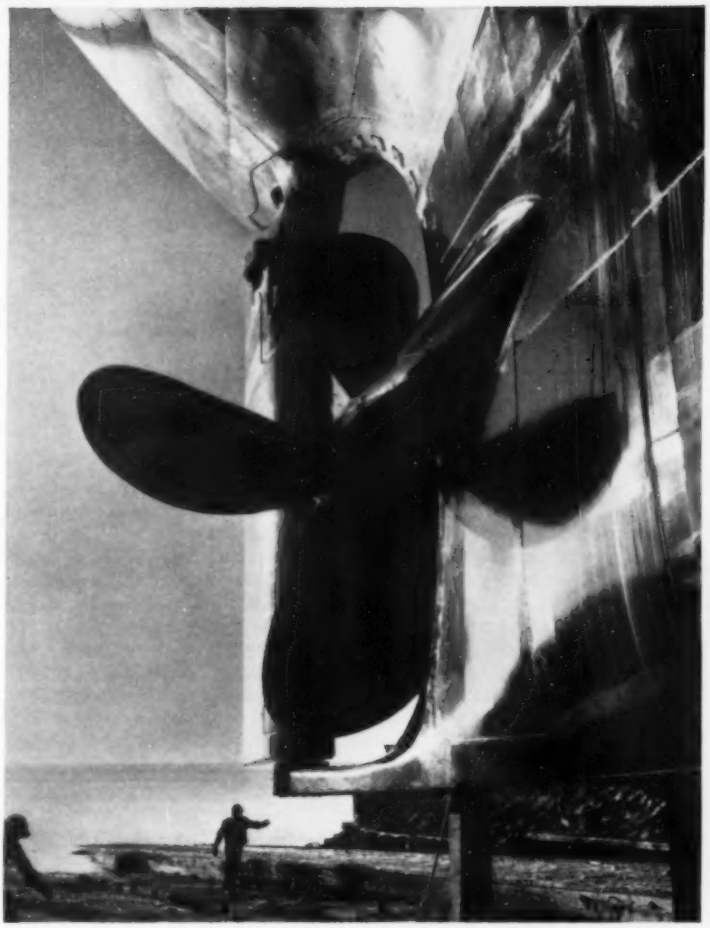
Throat depth varies from 12 in. on the smallest bench model to 34 in. on the largest floor model, permitting from 90 to 195 stampings per min at greater distances from the edge of the sheet. Standard features are fully stress-relieved frames, rolling key clutch, and extra-long jibs. Presses are also available with special design features—flanged slides, semi-automatic or automatic lubrication, air friction clutches with pushbutton controls and spring or air counterbalances for presses with long strokes or flanged slides.

Presses with capacities from 22 to 60 tons can be single-geared or not geared, and are also offered with an adjustable stroke range.

E W Bliss Co, Press Div, Canton, Ohio



Heavy sections like rudder posts and propeller blades can be gamma ray inspected with ⅓ shorter exposure—and welded seams can be radiographed more rapidly with available portable or low kv x-ray equipment—when Kodak Industrial X-ray Film Type KK is used.



. . . cut exposure time 1/3 with New Kodak Industrial X-ray Film TYPE KK

Where heavier sections are to be radiographed or where the output of available x-ray or gamma ray sources is limited, Kodak's new Industrial X-ray Film Type KK is the film to use.

This film shows as much as 50% increase in speed over the well-known Type K Film. It means more work can be done—that exposures can be cut by a third. And those who have tried Type KK tell us that its higher contrast, offsetting a slight increase in graininess, provides improved radiographic sensitivity.

To learn how Kodak Industrial X-ray Film Type KK can extend the service of your present radiographic equipment, get in touch with your x-ray dealer or Kodak Technical Representative.

EASTMAN KODAK COMPANY
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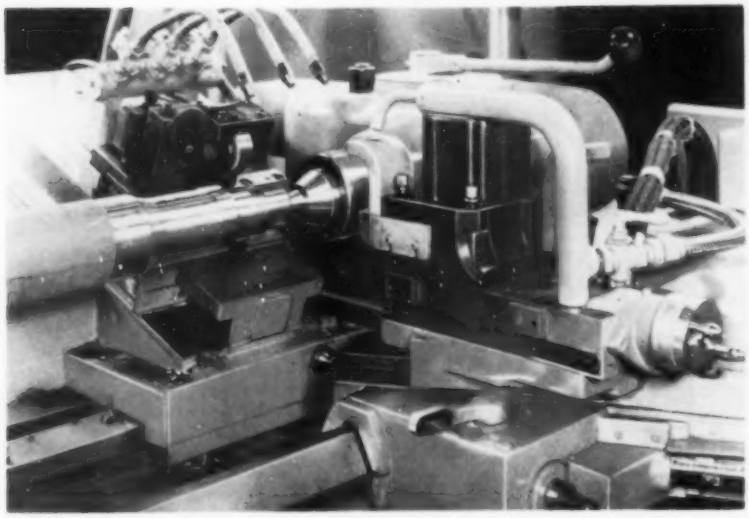


Monarch Introduces Self-Indexing, Two-Position, Hydraulic Turret

Designed to accommodate two 1 x 1½-in. tools, this new, hydraulically-actuated turret indexes 180° to a positive stop in either direction. Operation is entirely automatic; control being supplied by the multi-cycle programmer mechanism of the Model 21 Mona-Matic lathe, for which the turret is specifically designed.

The turret, in normal operation, is programmed to index just prior to the last cutting cycle, so that one tool is used exclusively for finishing. Programming, however, can be adapted to meet any machining requirement. An on-off switch allows the operator to lock the turret in one position, bypassing the automatic control. Positive locking is accomplished by a combination of hydraulic and mechanical means.

Massive construction and the fact that the turret becomes an integral part of the lathe's tool-slide insure maximum rigidity and accuracy. Hydraulic pressure is supplied to the turret by the machine's standard hydraulic pump and reservoir system.

Monarch Machine Tool Co, Sidney, Ohio

Steel-Based Tooling Compound Cuts Tooling Costs by 85%

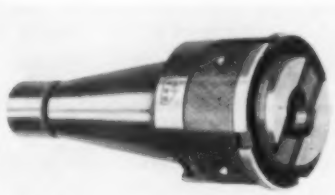
Two-component (steel and epoxy-type resin) punch-and-die material, 3M tooling compound 113, is designed for use in place of expensive machined metal tools for prototype or short-run draws of difficult shapes. In simpler metalforming, tools made of the compound can be used for production runs in the thousands of pieces. Such tools have also been used successfully for corner-ironing and complex contours having double draws.

The compound is more than 90% steel, has a compressive strength of 22-26,000 psi, and impact strength of 0.4 ft-lb per in. of notch. It also has the abrasion resistance and machinability necessary for standard press setup and running operations.

The metal powder component can be formed into shapes having good dimensional stability or "green strength." The thermosetting, epoxy-type liquid resin is used to impregnate the preforms or molded shapes to make them permanent and durable.

Present price range is from $12 per 4-lb sample kit to a price of $2 per lb for orders of 500 lb or more. Data sheets available.

Minnesota Mining and Mfg Co, Dept B8-32, 900 Bush St, St Paul 6, Minn



Cutting Tool Holder Designed With Quick-Change Feature

Design of Wej-Lok eliminates need for use of wrench or screwdriver for locking tools in holders. Simple hand spinning of the retainer ring locks or unlocks inserted RH or LH tools. In locked position, the flat surface of holder wedge is tightly seated in mating notched section of tool shank. Normal operating torque tends to further tighten wedging action, preventing possibility of wobble.

Detroit Reamer & Tool Co, 780 Maple Rd, PO Box 174, Birmingham, Mich

Submerged Arc Welding Machine Permits Manual Guiding of Arc

The Lincolnweld ML-3 machine is a mechanized unit which provides automatic wire feed, flux flow and travel speed, but permits manual guiding of the welding arc. Unit feeds a continuous wire electrode from a coil to a hand-held gun which is held against the joint. The gun is moved along this joint at a preset speed by a small motor.

A low pressure air system brings flux from a large tank to the gun. The flux drops from the gun to completely cover the arc at all times, yet it does not tend to flow ahead of the arc and make it difficult to see the seam.

Speeds up to 70 ipm (using up to 600 amp) are possible. The machine can be used on materials ranging in thickness from 10 gage up. The operator can devote his full attention to guiding. Because the gun is so maneuverable, the operator can readily follow contours and shapes, or weld any type of downhand joint.

Electrical circuit and control system of the ML-3 is also new. Unit operates from any variable voltage motor-generator set or rectifier with capacity to supply 400-600 amps DC. A separate 115-v AC source is required for the control circuits. Arc striking employs the "hot-start" method. Approximate cost of the machine is $950.

Lincoln Electric Co, Cleveland 17, Ohio

OSBORN®

BEFORE BRUSHING—
Brass and copper tubing ends have sharp edges and rough burrs after cut-off.

AFTER BRUSHING—
Burrs and sharp edges are gone. Tube end-surfaces are smoothly, uniformly blended. And Osborn Power Brushing does the job up to 400% faster.

Bright idea for reducing costs

. . . with OSBORN Power Brushing means 400% more parts per hour

HERE'S HOW IT'S DONE—*Simple, double-end brushing machine, using Osborn Master® Wheel Brushes, has two power heads and central conveyor. Heads are adjustable to handle deburring and edge-blending of various tube lengths.*

HERE'S how rough end-burrs are quickly, easily removed from metal components—and how this manufacturer does the job up to *400% faster with Osborn Power Brushing.*

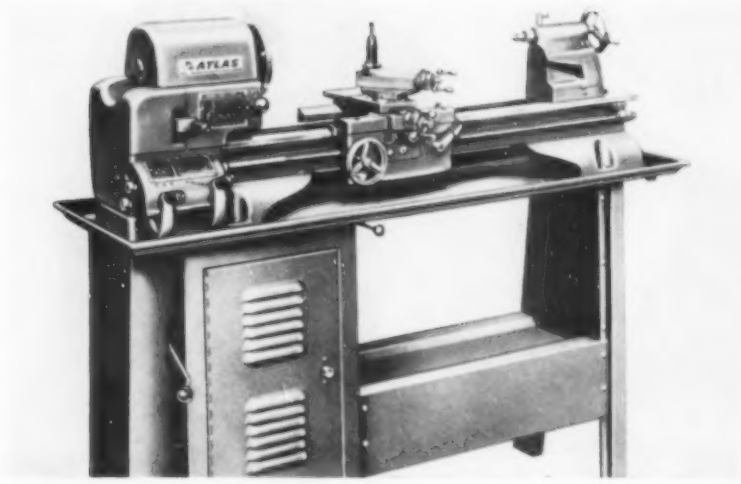
After the rough cut-off operation, cylindrical parts—like these tubes for example—are simply fed through a hopper . . . past rotating Osborn Brushes.

As the tubes are rotated by the action of the brushes, all burrs are thoroughly removed . . . tube ends are smoothly, uniformly blended.

In many cases, product quality is greatly improved at the same time costs are being cut with Osborn Power Brushing. An **O**sborn **B**rushing **A**nalysis made on *your production* can show where and how you can save money today, too. Write *The Osborn Manufacturing Company, Dept. E-69, Cleveland 14, Ohio.*

Osborn Brushes

BRUSHING MACHINES • BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY



Atlas Introduces Line of 12-in. General-Purpose, Back-Geared Lathes

These Atlas lathes are completely new from the ground up—inside and outside. They are said to offer greater capacity, performance and value than ever before. Lathes are available in pedestal base models with underneath drive with two V-belts driving the spindle, and in bench models with horizontal bench-mounted countershaft.

Pedestal base lathes come in two sizes. No. 3990 (illustrated) has 12-in. swing, 24-in. centers, 42-in. bed, and quick-change gears. No. 3991 has 12-in. swing, 36-in. centers, 54-in. bed, and quick-change gears. Both provide 54 thread selections, 4 to 240, standard, right or left. Sixteen spindle speeds are available (8 direct, 8 back-geared) from 28 to 2072 rpm. Longitudinal feeds range from 0.0042 to 0.250 in. PRS. Cross-slide travel is 6½ in.; compound travel is 2¼ in.

The bench lathes are available with quick-change or standard change gears. Quick-change gear models provide 54 thread selections, 4 to 240, standard, right or left; and feeds of 0.0042 to 0.250 in. PRS. Standard change gear lathes provide 98 thread selections, 4 to 96, standard, right or left; and feeds of 0.0024 to 0.0087 in. PRS. Sixteen spindle speeds are available (8 direct, 8 back-geared) from 28 to 2072 rpm.

Motors of ½ or ¾ hp are recommended for all models. A full line of accessories is available—including chucks, centers, toolholders, rests, turrets and other attachments.

Atlas Press Co, 2210l N Pitcher St, Kalamazoo, Mich

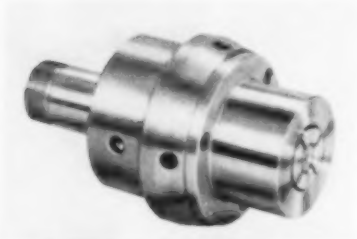
Buckeye Automatic Drill Features Mechanical Feed System

Buckeye-Matic automatic drill is reported to combine machine tool precision with portable tool convenience. Once started, the tool goes through the entire drilling cycle, including retraction and stopping, automatically. Designed for applications where drilling is done at several points on a large workpiece, it may also be used with permanent fixtures, where work would be brought to the tool.

Rated capacity is 1½ in. in steel, greater in aluminum and softer materials; max stroke of 6 in. can be adjusted by a micrometer screw. Mechanical feed insures forward progress as long as drill rotates. This is important, as many metals will work-harden if heated by a twist drill turning without cutting. An overload relief mechanism automatically starts retraction and shut-off cycle if an obstruction or broken drill subjects spindle to overload.

Tool is adaptable to drilling, reaming, boring, counterboring, and countersinking. Clean, accurate holes are assured even in the toughest materials, including many of the new alloy steels.

Buckeye Tools Corp, Springboro Pike, Dayton, Ohio

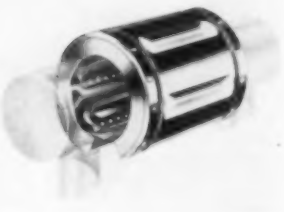


New Hardinge Expanding Collets Simplify Machining Operations

Expanding collet assembly for precision internal chucking is engineered for Hardinge toolroom and production lathes. Exact concentricity claimed by manufacturer is said to simplify the obtaining of concentric and square shoulders, faces, and diameters from a previously machined bore.

Unit eliminates special shouldered expanding collets since the back stop is machined in place and is a dead stop. Exact work lengths are said to be easily obtained. Both the stationary expanding collet and work locating stop have no end movement. All parts are standard. Details in bulletin EC.

Hardinge Brothers, Inc, Elmira, NY



LINEAR BALL BEARING, open type, permits the use of shaft support members along the length of the shaft traversed by the bearing. Bearings are made to standard dimensions for shaft diameters from 1 to 4 in. Open construction permits adjustment of bore dia by use of set screws or other clamping devices—*Thomson Industries, Inc, Manhasset, NY*

Lehmann 18" Hydratrol lathe turning 4" Nitralloy 135 modified bar stock. Tool is K7H carbide nitriding steel. Feed .011", depth of cut .100", speed 300 sfm. Coolant is 20% emulsion of Gulfcut Heavy Duty Soluble Oil.

You can make heavier cuts... at higher speeds...with new GULFCUT HEAVY DUTY SOLUBLE OIL

Norton Type C Cylindrical Grinder grinding SAE 4140 steel connecting rod bolts to 4 micro-inch finish. Speed is 225 sfm, depth of cut .020" with 30" x 1" aluminum oxide wheel. Emulsion concentration 32:1 Gulfcut Heavy Duty Soluble Oil.

This aluminum connecting rod and piston assembly was turned at 4000 sfm to a 6-micron rms finish with Gulfcut Heavy Duty Soluble Oil.

You'll get finer finishes, too, when you use new GULFCUT HEAVY DUTY SOLUBLE OIL

For threading, boring, facing, turning, grooving, grinding, or any operation that requires an emulsifying oil, you'll get better results with new Gulfcut Heavy Duty Soluble Oil. On tough jobs where other general purpose oils have failed, Gulfcut Heavy Duty Soluble meets all requirements—even on low machinability metals.

This new oil is economical, too. An average mixture of 1 part to 25 parts of water provides good cooling and superior lubrication. In many field tests, it has performed well even in mixtures of 1 to 150!

Gulfcut Heavy Duty Soluble Oil won't separate or gum in wheels, slides, ways or other machine parts. It provides greater protection against rust . . . has excellent emulsion stability, even in hardest water . . . has high surface-wetting properties for more effective cooling . . . and contains powerful anti-foam and anti-weld agents. In addition, it contains an effective germicide to help eliminate rancidity.

To improve your production and cut your machining costs, try new Gulfcut Heavy Duty Soluble Oil. For more information, just call a Gulf Sales Engineer at your nearest Gulf office. Or use the coupon on the next page to get illustrated booklet.

GULF

In the complete Gulfcut line, there's a cutting oil to meet your every need

By ordering "Gulfcut" you can select from many different shop-tested cutting oils, including mineral-lard oil, sulfurized-mineral oils, sulfurized-mineral-lard oils, sulfo-chlorinated-lard oils, and emulsifying oils. Your Gulf Sales Engineer will gladly advise you.

GULFCUT 11A AND 11D

Non-staining, non-corrosive mineral-lard oils, recommended for machining non-ferrous metals.

GULFCUT 21A, 21B AND 21C

Sulfurized-mineral oils made by a special Gulf process to provide greater sulfur activity over a wide range of machining operations. They are transparent and relatively light in color.

GULFCUT 31A AND 31C

Sulfurized-mineral-lard oils that excel over a wide range of machining operations on many types of steel. Have outstanding anti-weld properties and load carrying ability. Sulfur is combined in three different forms for maximum chemical activity.

GULFCUT 43A

Sulfo-chlorinated oil for high production machines requiring an oil of this type for pipe cutting and threading, screw and bolt making machines, and cutting operations on steels with free and moderate machinability characteristics. Contains a corrosion inhibitor to protect ferrous metals and machine parts.

GULFCUT 43B

Specially blended sulfo-chlorinated-lard oil for high production machines requiring an oil of its viscosity and compounding. Dual purpose—suitable for machine lubrication as well as for cutting operations.

GULFCUT 45A AND 45B

High quality sulfo-chlorinated-lard oils with excellent load carrying and anti-weld characteristics to insure best results on the most difficult jobs. Have heavy concentrations of sulfur, chlorine and fatty oil. May be diluted for less difficult jobs.

GULFCUT 41A, 41B AND 41C

Sulfo-chlorinated-lard oils for high production jobs on automatic machines. Engineered with the proper combination of sulfur, chlorine and fatty oil. They also provide proper lubrication for machine tools.

GULFCUT 41TG

This is a sulfo-chlorinated-lard oil specifically compounded for thread grinding operations.

GULFCUT SOLUBLE OIL

Emulsifying oil with a wide range of uses in cutting, forming and rolling operations where a coolant with moderate lubricating properties is required. Mixes with warm or cold water as high as 100 to 1. Forms homogeneous and exceptionally stable emulsions.

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Pittsburgh 30, Pa.

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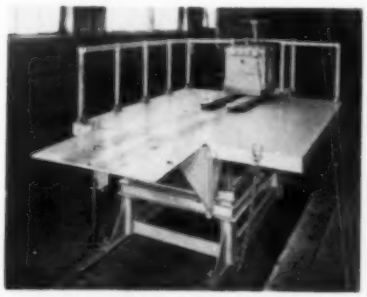
FOR ALL YOUR NEEDS

Lathe Indicator Eliminates Chance of Operator Error

Designed to enable a semi-skilled machinist to hold tolerances closer than ± 0.001 in. on ordinary engine lathes, the Sure Stop maintains close tolerances in the duplication of machine parts.

Device has five easily adjustable stop rods which index accurately to allow a wide range of machining possibilities. Two dial indicators are available. One is graduated in 0.001 in., the other in 0.0001 in. Movable limit stops are mounted on the indicator to enable an operator to quickly find and duplicate his previous setting. Unit is completely O-ring sealed for protection.

DSC Machine Co, 21 Bertel Ave, Mount Vernon, NY



Portable Elevator Maintains Constant Level With Truck Beds

Portable elevator, designated Portelevator, is used as a variable-height loading dock. It maintains constant level with truck beds, eliminating the usual ramp. Another outstanding feature is that the unit can be positioned by overhead crane.

Platform is 10 x 12 ft exclusive of extensions which form a bridge between platform and truck, and a "pigeon-hole" for the fork truck during delivery of materials by overhead crane. Load capacity is 10 tons,

NO, NO... a thousand times "NO"

"NO loss of time," say the thousands of users of LAMINUM SHIMS...

NO machining!

NO grinding!

NO counting!

NO stacking!

NO miking!

LAMINATED SHIMS OF

LAMINUM

SURFACE BONDED... THEY peel FOR ADJUSTMENT

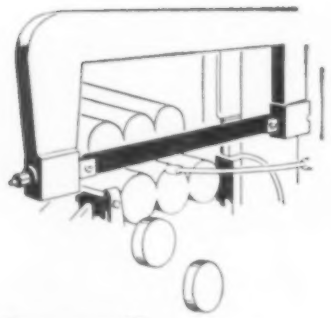
Laminated Shims of LAMINUM now available in

STAINLESS STEEL with laminations of .002" or .003"	ALUMINUM with laminations of .003" only
BRASS with laminations of .002" or .003"	LOW CARBON STEEL with laminations of .002" or .003"

LAMINATED SHIM COMPANY, INC.

Shim Headquarters since 1913

3104 Union Street, Glenbrook, Conn.



Capewell High Speed Power Hack Saw Blades can take higher speeds and feeds for higher production and profit

3 TYPES FOR EVERY PURPOSE

TECHNITE®

HIGH SPEED®

SAFETECH®

See Your Capewell Distributor

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

lift is 22½ in. (from 36½ min to 59 max); lift speed is 13 ipm.

Power is furnished by a 5-hp, 220/440-v crane hoist motor. Power is transmitted through a roller chain, worm, worm gear and screw, and is applied to each of the four corners of the platform. Bulletin available.

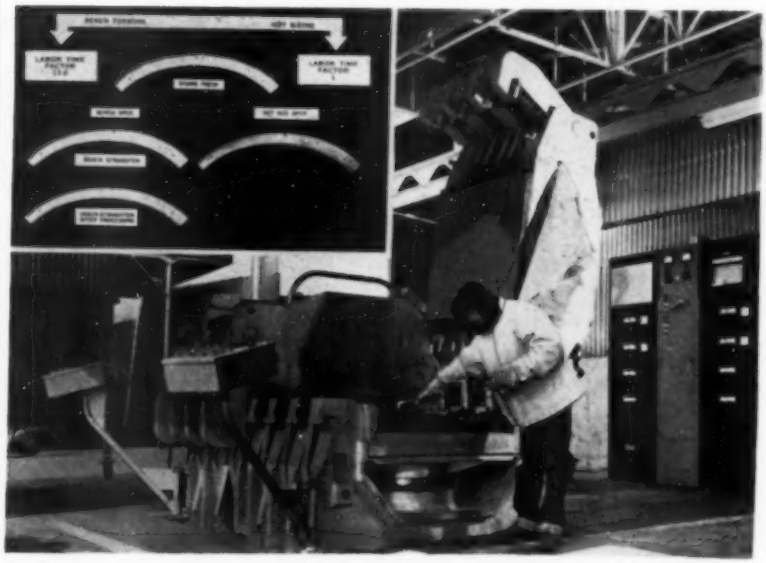
Hamilton Tool Co, Ninth St at Hanover, Hamilton, Ohio

ULTRASONIC CLEANER, Ultracleaner Model 500A, a 53-lb SS unit, accommodates parts up to 10 in. in length. One or two chambers may be used separately or concurrently — *Lawrence Manufacturing Corp, Evans Terminal, North Broad St, Hillside, NJ*

Vertical Turning and Boring Machine Handles Large-Dia Work

This special-purpose vertical turning, boring and facing machine was designed for machining large propellers, but the basic machine can be used for a wide variety of large-diameter work. Machine features extra-large swing capacity of 72 in. and complete pushbutton control of all major machine functions. The

(Continued on page 142)



TITANIUM AND HIGH-TEMPERATURE STEEL PARTS for advanced aircraft and missiles are precision formed on this hot sizing press. Parts can be formed 13 times as fast and to infinitely more accurate tolerances than with bench methods formerly used. Further economies are gained by reduction of rejects and ability to use lower-cost dies. North American developed the machine and has applied for patents—*Sheridan-Gray, Inc, 24701 Crenshaw Blvd, Torrance, Calif*

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY

Only Circle C is quality controlled by impact testing

Every Circle C High Speed tool bit is tested under impact to make sure you get the best bit that can be made. This is the final test in a series of quality control checks made during each stage of production, from Firth Sterling's exclusive double melting process to the finished bit.

Being double melted, Circle C has greater homogeneity that assures toughness and consistent performance, delivers cutting capacity far beyond that of ordinary high speed steels. With Circle C bits you can use higher operating speeds, obtain longer tool life and increase your production. And the practical, well balanced composition gives Circle C unusual red-hardness and wear resistance, provides ONE grade for almost all your machining operations.

Circle C is one of a family of outstanding high speed steels, including Van Chip, Blue Chip and Star-Mo, accepted throughout industry for reducing machining costs today. All are evidence of Firth Sterling's metallurgical leadership—a background of over 68 years of research and development.

* * *

*For assistance with your metallurgical problems, powder or molten, simply call your nearest Firth Sterling sales office or distributor. For complete information on High Speed tool bits—**and the new Circle C throw away inserts**—write for descriptive bulletin TBI-57:* FIRTH STERLING, INC., Dept. 91D, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

Visit our Booth at the ASTE SHOW Philadelphia Booth 202

PRODUCTS OF Firth Sterling METALLURGY

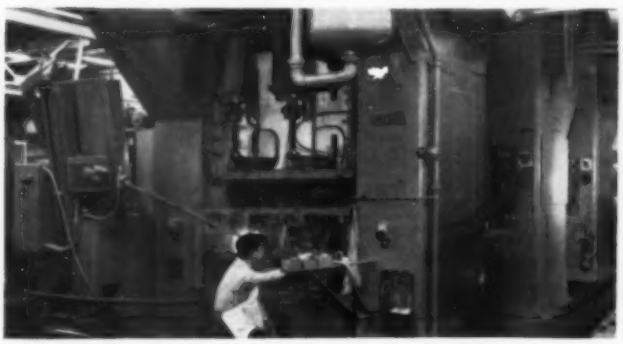
HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • TITANIUM • STERVAC & STERCON SUPER ALLOYS

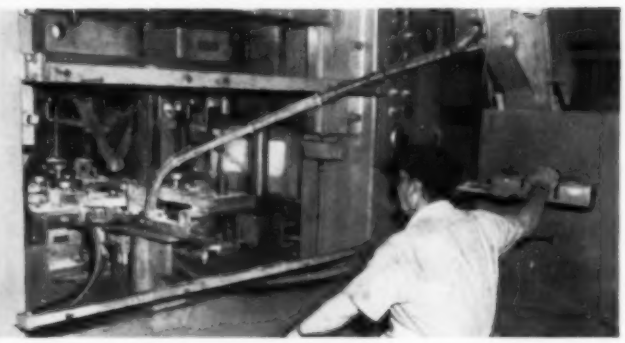
FIRTH STERLING TRADE MARK

TRADE Verson MARK

COLD

THESE VERSON EXTRUSION PRESSES ARE PROVING DAILY THE ECONOMICAL ADVANTAGES OF THE COLD EXTRUSION PROCESS

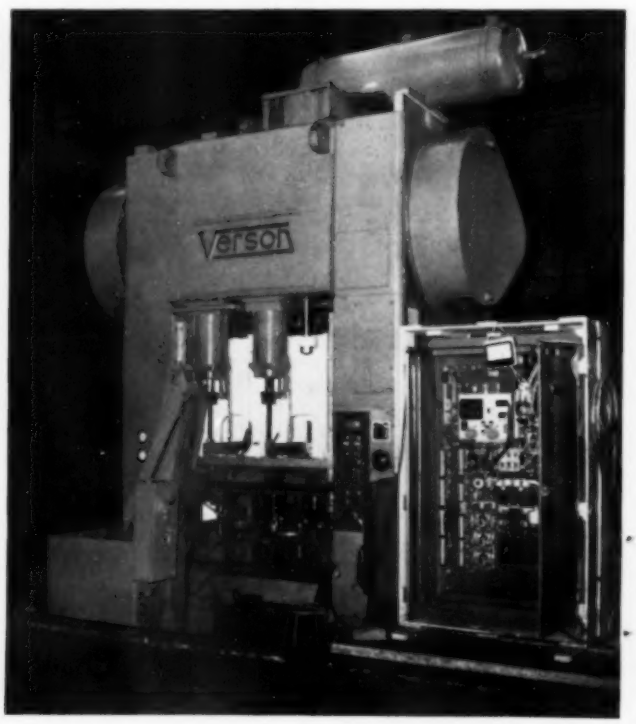




Above is a line of three identical 400 ton Verson extrusion presses producing the automotive valve tappet shown on the facing page. A close-up of the die space is shown at the right. All three presses are complete with cushion equipment, automatic feeds and dial type tooling. Each press operates at 30 SPM and produces two parts per stroke.

A pioneer installation of two Verson extrusion presses rated at 1500 and 4500 tons respectively.

Successful operation on Verson extrusion presses in your plant is assured by tryout on production runs before shipment.



EXTRUSION...

it may be your best opportunity for improving your profit spread

In the intensive search for ways to hold materials and manufacturing costs down, cold extrusion has emerged as a major weapon. Scores of piece parts that formerly had to be machined from bar stock or hot forged, can now be extruded at a fraction of their previous cost. Scrap loss and the amount of machining necessary has been slashed.

This is no longer a theoretical concept. Verson cold extrusion lines have been in production for as long as three years. Since 1955 Verson has conducted a comprehensive Cold Extrusion Research and Development Center in its Chicago plant for the purpose of developing and proving tooling and lubrication techniques.

Out of this experience has come the cold extrusion know-how necessary to evaluate the adaptability of the process to your production requirements. With the ever-tightening squeeze on your profit margin, you can't afford *not* to investigate the cost-cutting possibilities of Verson Cold Extrusion. Get in touch with Verson, today. For recommendations, send an outline of your needs.

A special report on Tooling for Cold Extrusion will give you a better insight into what can be done with cold extrusion. Write for your copy; there's no obligation.

VERSON COLD EXTRUSION CAN REDUCE MATERIAL COSTS, CUT MACHINING COSTS ON JOBS LIKE THESE

Shown here in both exterior and cross section views is a propeller shaft end for an automotive drive shaft. It is made from AISI 1037 steel in two operations in 600 ton Verson extrusion presses. The part is 3 3/16" in finished length and is produced at a rate of approximately 1200 per hour.

This is the automotive tappet produced in the presses shown at the upper left on the facing page. Shown are the slug and cross sections after first and second operations. After heat treating, finish grinding and drilling of an oil hole, the part is ready for installation.

This is a universal joint bearing race made in one operation on a 400 ton Verson extrusion press. The press operates at 30 strokes per minute, producing two of the 1 3/16" x 5/16" parts per stroke from AISI-1018 steel.

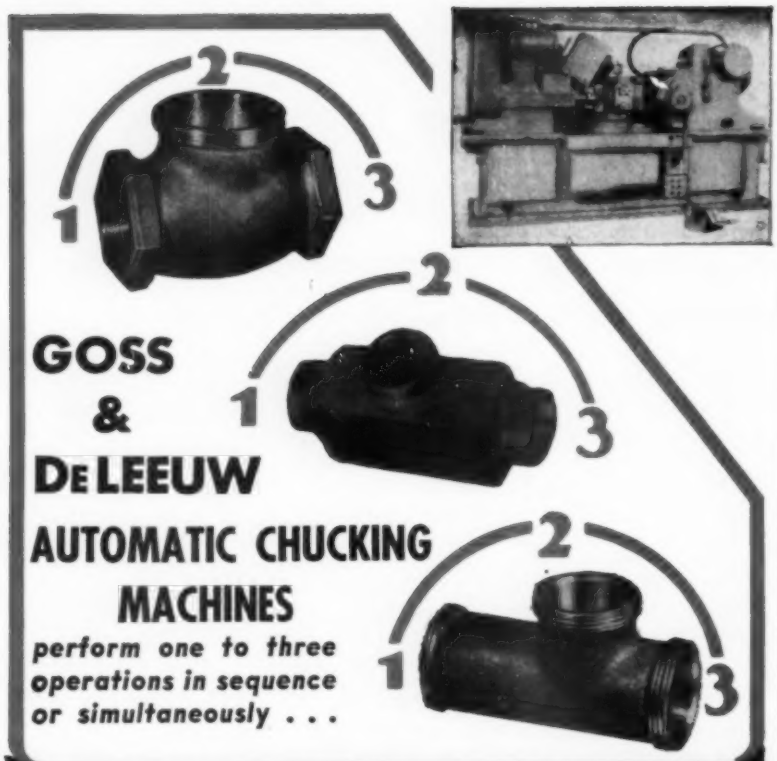
A Verson Press for every job from 60 tons up

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES



TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.

Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS & DeLEEUW
PRODUCT QUALITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

42-in.-dia, 3-jaw, scroll type combination chuck is mounted on a heavy-duty spindle. Infinitely adjustable spindle speeds range from 10 to 230 rpm.

Horizontal and vertical feed and rapid traverse movements are controlled by electric clutches. Infinitely adjustable feed rates range from 0.002 to 0.030 in. per revolution of table.

Taper boring is accomplished by either of two methods—by inclining the vertical slide, or through the use of a taper bore generating attachment which couples the horizontal actuating screw and the vertical actuating spline in a fixed ratio.

Vertical slide is equipped with a 5-station turret and has 24-in. travel. Cross-slide can be positioned and fed from any point from 24 in. right of table center to 6 in. beyond table center. Complete programming of turret indexing, cross- and vertical slide feed and positioning, as well as taper bore generating is available as an optional item in machines of this design.

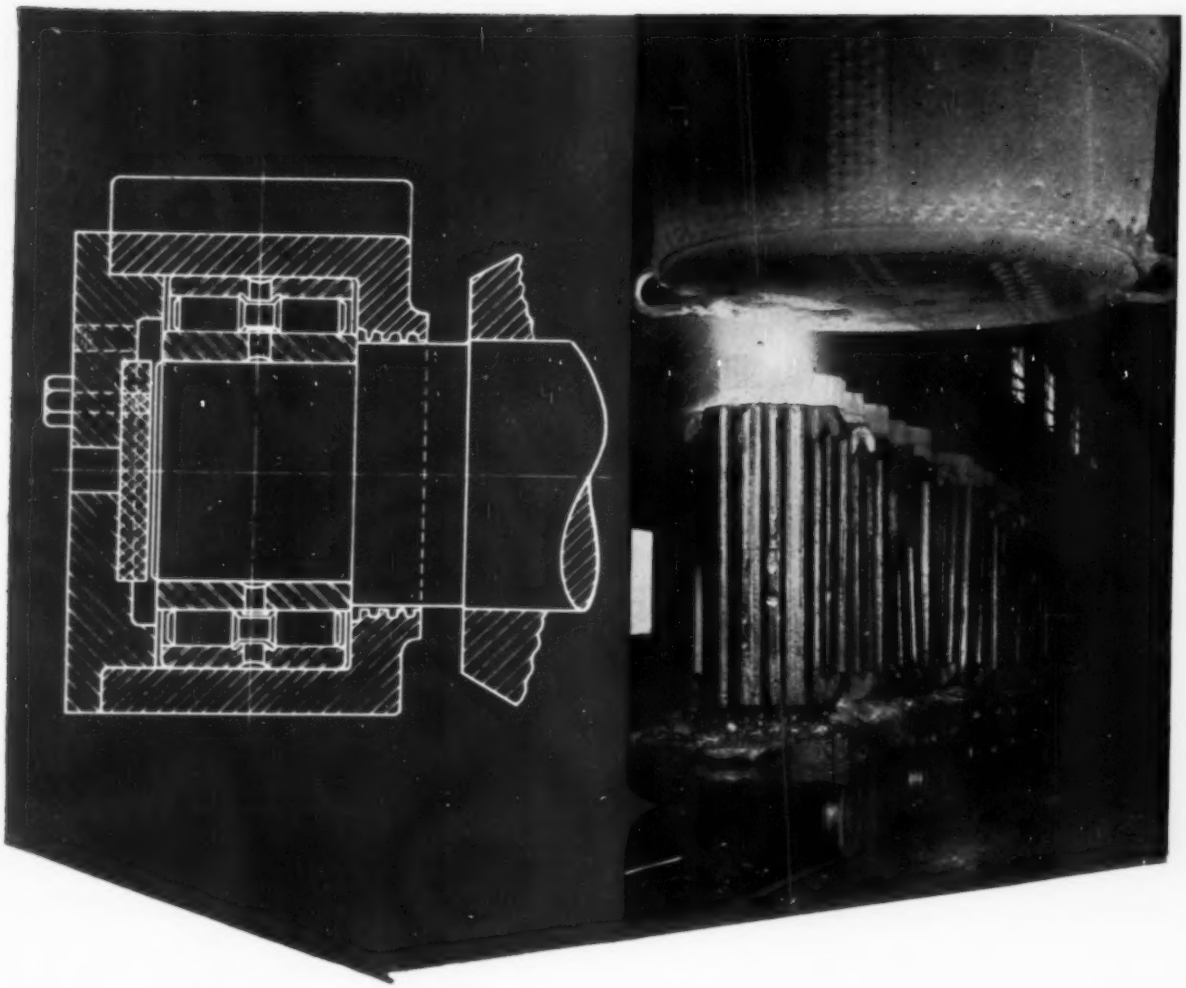
Kaydon Engineering Corp, Frauenthal Div, Muskegon, Mich

Compact Sahlin Press Extractor Designed for Easy Maintenance

Over-all length of the 6000 Series Horizontal Iron Hand is only 18 in. greater than length of stroke. Models range in stroke length from 36 in. with speeds up to 40 spm.

Features include use of a geared non-slip belt in place of roller chains or rack and pinions. Belt needs no lubrication, reportedly has run over a million strokes without stretching. Universally adjustable jaw permits grabbing of the piece at any angle. Unloader can be mounted on the press upright, on a conveyor, or on a universally adjustable roll-away base. With jaw assembly removed, it can be used as a power unit for a parts feeder or transfer mechanism.

Sahlin Engineering Co, PO Box 289, Birmingham, Mich



Bearings, Inc. engineering service . . . solves another bearing problem

Ingot mold cars for a large tube mill were continually out of service due to the short life of babbitt, bronze or other bearings originally supplied in the cars.

The Trouble? Bearings, Inc. engineers found shock loads far beyond the capacities of the original bearings. Extreme wear on bearings due to excessive skewing, bent axles and uneven track.

The Answer. Shown above is the Bearings, Inc. drawing of the installation that replaced the original bearings. It has greatly increased load capacity and no dimensional change is required in the shaft or bearing housing.

The Result. The new bearing is designed on a new principle that keeps rollers in line and eliminates skewing. Shock loads due to uneven tracks have little effect on our installation for its construction makes possible a greater number of rollers available to support the load at all times.

This is just one of the many such problems we have solved for our customers. In all cases we supply only bearings we are authorized to distribute. They are new and come to you fresh in the manufacturers' boxes.

If you have a bearing problem or need replacement bearings in a hurry — call or write our branch nearest you, they're ready to give fast service.

Providing bearing service in the North ➤

BEARINGS, INC.

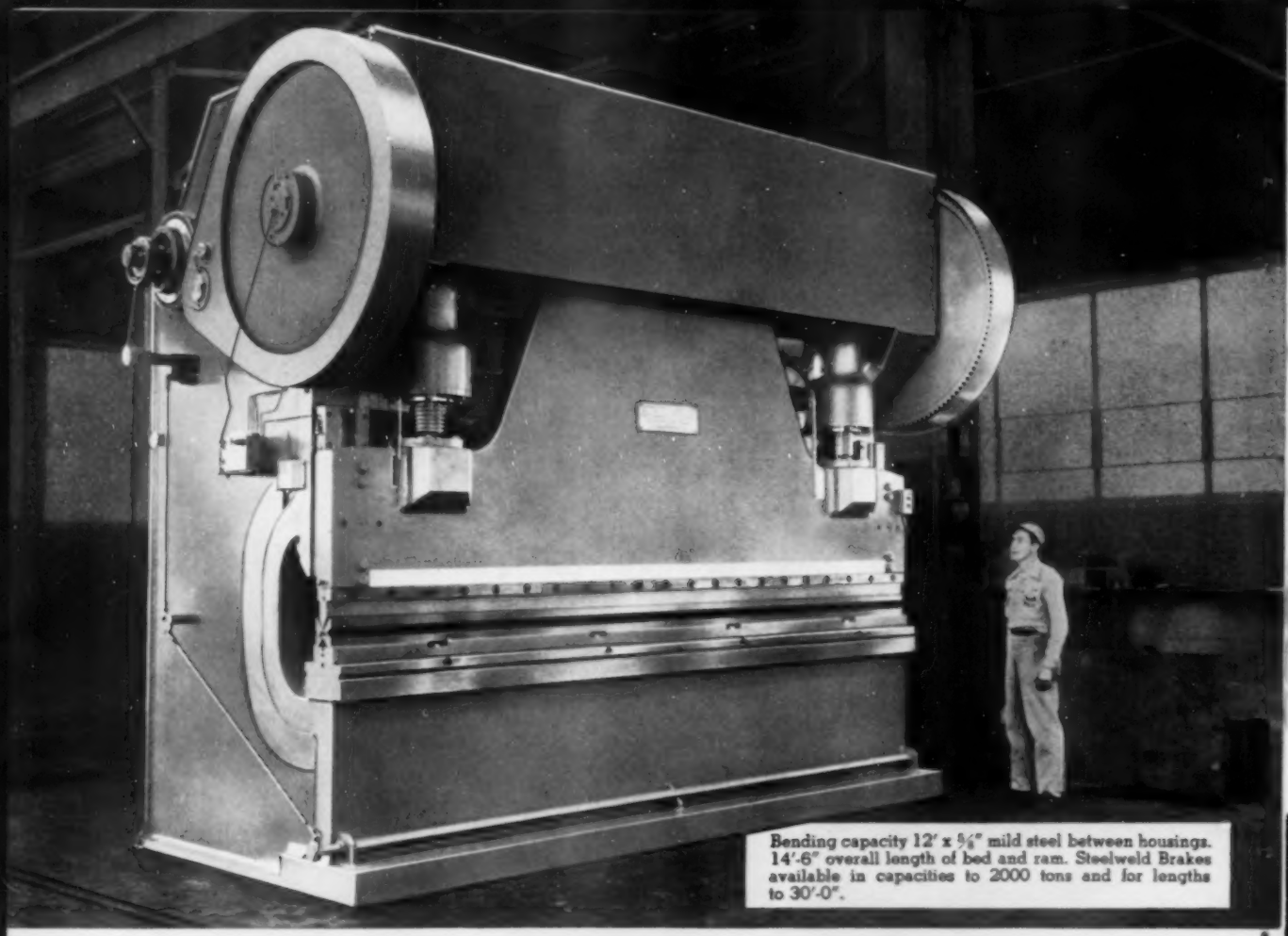
OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Balanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

In the South ➤

DIXIE BEARINGS *INCORPORATED*

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville



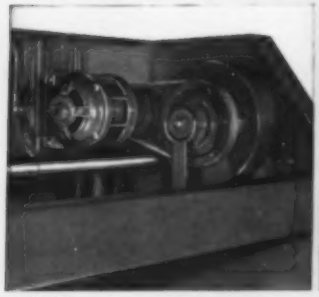
Bending capacity 12′ x 5/8″ mild steel between housings. 14′-6″ overall length of bed and ram. Steelweld Brakes available in capacities to 2000 tons and for lengths to 30′-0″.

BRAKES and SHEARS BUILT

STEELWELD machines are built to withstand the rigors of mass-production high-speed work, as well as meet the needs of jobbing shops requiring frequent set-up changes. They are liberally designed throughout to assure maximum service with minimum maintenance. A wide array of desirable features are provided, some of which are not available elsewhere.

Steelweld Brakes and Shears are easily adapted for special requirements. Our engineers will be glad to work out design changes to speed production, improve safety or bring about other advantages for specific applications.

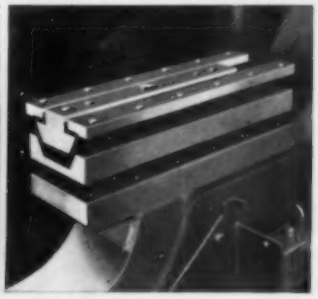
A Few of the Outstanding Press Brake Features



SW-309

Long Life Clutch and Brake

Heavy construction assures long trouble-free life. Clutch unit is duplicate of brake and parts interchangeable. Adjustments easily made without tools.



SW-438

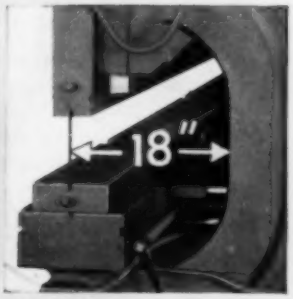
Slides Compensate For Wear Automatically

V-shaped slides and guides eliminate loose gibbing. Take up wear automatically. Easily removed and replaced.

SW-304

Six Large Main Bearings

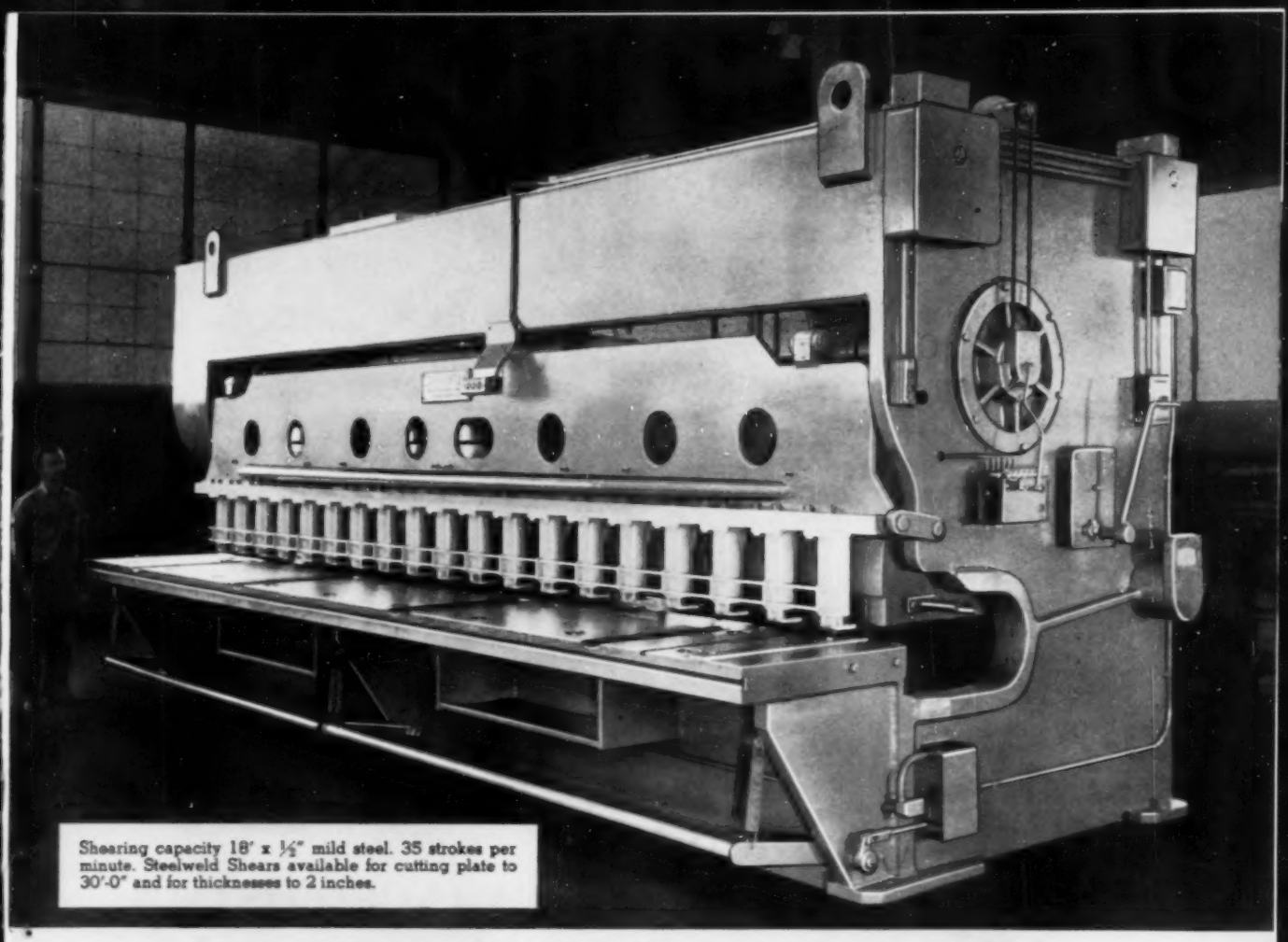
Each of the two eccentric shafts which drive the ram has three heavy bronze bearings. Ram adjustment is made by revolving nut. Screws do not turn; therefor, ball joint wear is reduced.



SW-441

Extra Deep Throat

18-inch throat is standard on all Steelweld Brakes. This permits making bends to 18 inches from edge of plate for full length of dies.



Shearing capacity 18' x ½" mild steel. 35 strokes per minute. Steelweld Shears available for cutting plate to 30'-0" and for thicknesses to 2 inches.

FOR **HEAVY DUTY** SERVICE

Many Important Shear Advantages

1. Pivoted blade operation.
2. No slides or guides to wear.
3. Knife clearance easily adjusted to suit plate thickness.
4. Smooth, sharp accurate cuts.
5. Low rake.
6. Negligible twist, camber and bow in cut pieces.
7. Fast cutting and high production.
8. Easy and simple to operate.
9. Convenient electric foot control.
10. Trouble-free mechanical hold-downs.
11. Easily arranged for squaring, slitting and notching.
12. Convenient, accurate, ball-bearing mounted back gauge.
13. Quiet operating.
14. Designed for safety throughout.
15. Long knife wear between grindings.
16. Knives easily removed and replaced.
17. All-welded one-piece frame with bed integral.

GET THESE BOOKS!

Catalogs No. 2010 (Brakes) and No. 2011 (Shears) give construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1457 East 282nd Street, Wickliffe, Ohio

STEELWELD

BRAKES and SHEARS

At The Ford Motor Company's Cleveland Engine Plant No. 1

AMERICAN BROACH & MACHINE DIVISION
BARNES DRILL COMPANY
BUHR MACHINE TOOL COMPANY
THE CROSS COMPANY
EX-CELL-O CORPORATION
EXPERT WELDING MACHINE CO.
THE FOOTE-BURT COMPANY
GREENLEE BROS. & CO.
THE HARTFORD SPECIAL MACHINERY CO.
THE HEALD MACHINE COMPANY
HOLCROFT & COMPANY
INDUSTRIAL METAL PRODUCTS CORPORATION
THE INGERSOLL MILLING MACHINE COMPANY
THE LAPOINTE MACHINE TOOL COMPANY
LANDIS TOOL COMPANY
THE R. K. LE BLOND MACHINE TOOL CO.
McDONNELL MACHINE TOOL, INC.
MICHIGAN TOOL COMPANY
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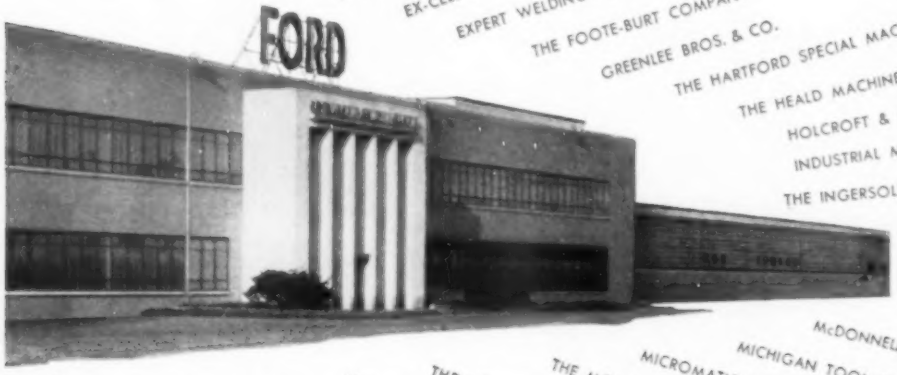
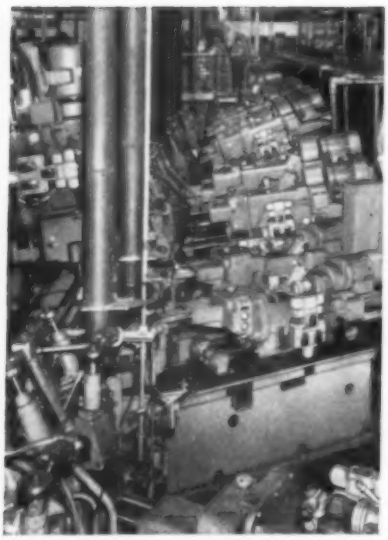
THE MORRIS MACHINE TOOL CO.
THE MOTCH & MERRYWEATHER MACHINERY CO.
NATIONAL AUTOMATIC TOOL CO.
SNYDER TOOL & ENGINEERING CO.
SUNDSTRAND MACHINE TOOL CO.
WICKES MACHINE TOOL DIVISION
WILSON AUTOMATION COMPANY



See our Exhibit in BOOTH 768 at the Design Engineering Show

VICKERS HYDRAULICS

HELPS CUT MAINTENANCE COSTS of Machinery Supplied by These Companies to This Modern Automated Plant



Typical transfer line installation shows ample use of Vickers hydraulics for actuation and control of automated operations.

High production is convincing proof of equipment reliability—one of many reasons why Vickers Hydraulics is engineered into equipment for modern automated production plants.

The above manufacturers find that Vickers Hydraulics simplifies installation and minimizes piping—benefits also enjoyed by the user. Vickers highly efficient pumps produce significant power savings . . . Vickers controls help minimize scrap and rework by providing precise positioning for machining and other in-process operations. Component dependability helps provide extended periods of uninterrupted production. Demountable unit construction simplifies on-the-job repairs and helps reduce downtime.

The Vickers complete line of components is ideally suited to hydraulic equipment standardization and interchangeability, reducing replacement inventory. Our application engineers will supply detailed information without obligation. General Catalog 5001B is available upon request.

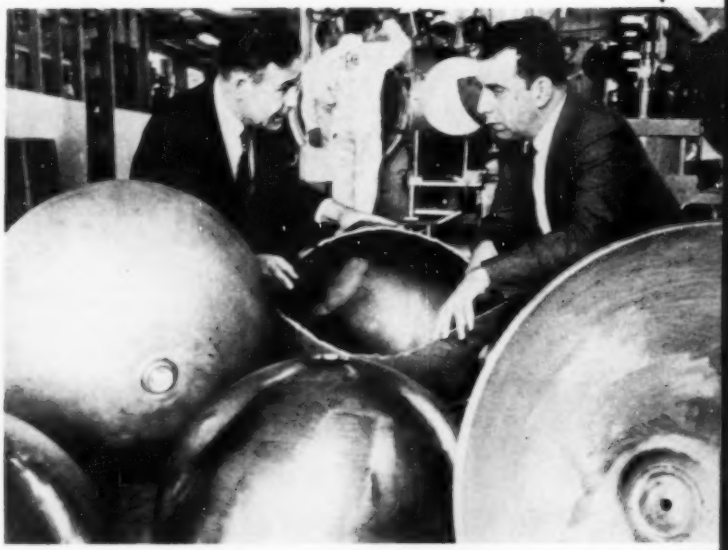
7995

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS TULSA • WORCESTER • Factories also in: AUSTRALIA, ENGLAND, JAPAN AND GERMANY • In Canada: Vickers-Sperry of Canada, Ltd., Toronto, Montreal and Vancouver

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

FIELD REPORT...



Titanium missile bottles for the Atlas ICBM . . .
Claimed to be the first large-scale usage of titanium in intercontinental ballistic missiles, these pressure bottles (they're stored with helium, control propellant flow) are shown (above left) being rinsed prior to heat treatment, and (right) undergoing inspection at final stages of completion by Morris Asimow, research director (left) and Fred Spiegel, vice president of Titanium Fabricators Inc

GE Gets Order to Build AF Missile Nose Cones

General Electric Co's missile and ordnance systems department in Philadelphia has Air Force go-ahead to begin production of nose cones and ground support equipment for the Thor IRBM. Size of contract and timetable still have to be worked out. GE, already working on a $158 million R&D contract for Thor and Atlas nose cones, will now shift into the operational phase, expects to hire between 50 and 100 technically trained employees initially.

Loewy-Hydropress Has Major Order

Mirro Aluminum Co, Manitowoc, Wis, has placed an order with Loewy-Hydropress covering equipment of a complete new rolling mill plant that Mirro will build on a 104-acre tract on the shore of Lake Michigan between Manitowoc and Two Rivers. Multi-million-dollar installation consists of a two-high reversing hot mill, a four-high nonreversing cold mill, and a Loewy-Hydromil for high-speed production of aluminum foil. Auxiliary equipment will include shearing lines, coiling machines, ingot and sheet annealing facilities.

Bethlehem Ship Gets APL Order

Two Searacer merchant ships will be built for American President Lines by Bethlehem Pacific Coast Steel Corp's Shipbuilding Division at San Francisco. The $29-million-plus contract is part of an APL program that calls for replacement of the entire fleet with new tonnage as vessels become 20 years old.

Hughes Plans to Hire 3500 More in 1958

Hughes Aircraft Co plans to employ 2000 additional scientists and engineers and 1500 professional and technical workers during the remainder of the year. Company's current payroll in southern Calif and Tucson, Ariz, is 2900 working on electronic armament control systems for interceptor planes of the US and Canadian Air Forces and the US Navy, Falcon guided missiles, ground radar systems, and commercial electronics products.

US Chemical Milling Expands

Latest addition in space to United States Chemical Milling Corp's West Coast operation represents a 50% expansion in plant size. Plant No. 3 will house special facilities of USCM's recently acquired forming and shaping subsidiaries, Missile-Air and Hydro-Metal Spinning corporations. Increased plant area will also enable the company to perform shearing, forming, spinning, and assembly on the main production line of many of the complex parts that were previously only chemically milled. Firm will employ an additional 100 technicians and specialists.

Convair Has Contract For Pilot Line Tartars

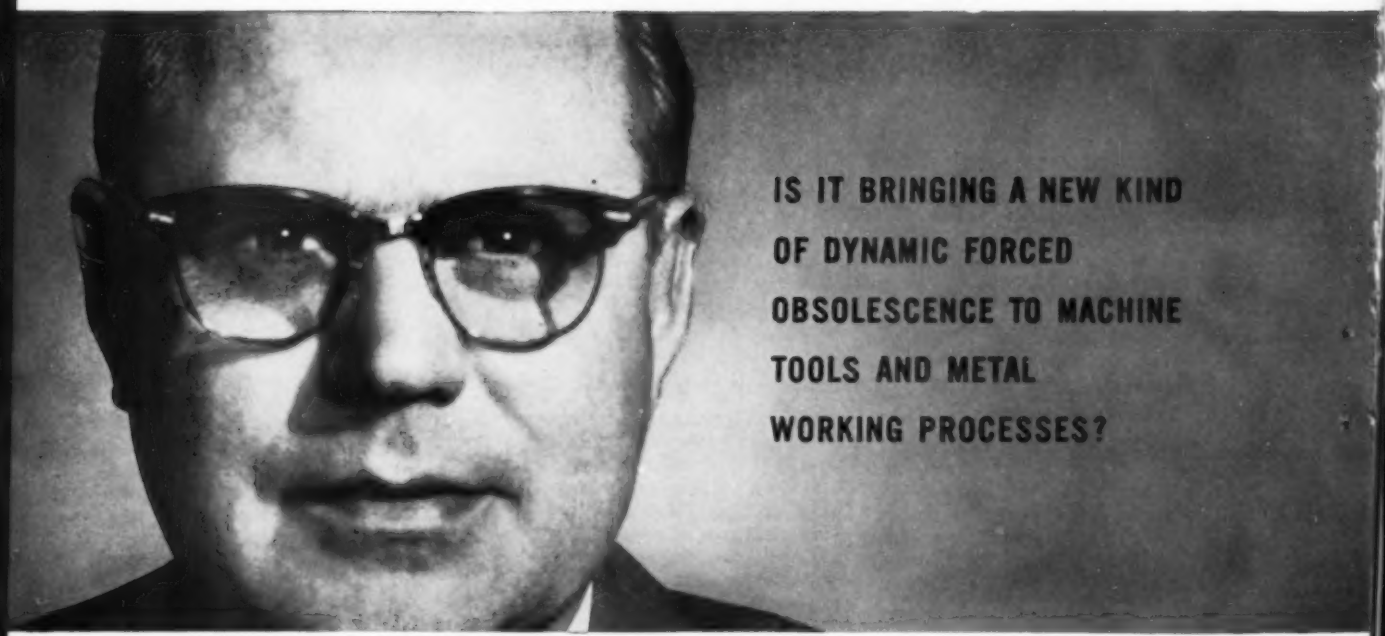
Navy has an $8 million order in with Convair for pilot line production of Tartar guided missiles, newest and smallest in Navy's surface-to-air category. After testing and evaluation, production versions are to be installed in 13 guided missile destroyers now being built, and in three heavy cruisers that will be converted into missile ships.

Marchant Building New Plant

Marchant Calculators, Inc, has arranged to borrow $6.5 million to help finance construction of its new plant and office building in Oakland, Calif, and to provide more working capital on hand.

(Continued on page 150)

The bright new era belongs to those who



C. R. DE VLIEG, Executive Vice President, DeVlieg Machine Company.

Here at Fair Street, we think that the answer unquestionably is "yes."

We have felt it already, as you must have, too, in your business. The evidence is everywhere indicating that we are racing into the greatest industrial revolution of all time. We are backing our own conviction with the dollars it takes to build the new highly efficient plant you see pictured here.

Technological progress of the last 10 years more than equals any previous 50 years in the history of mankind.

And still, relentless research goes on. One breakthrough into new areas of science and engineering is quickly followed by another. New materials, new methods, new processes, higher accuracy control and most significant of all, *vast product changes affecting every business are in the making.*

From it all is emerging what virtually amounts to a new philosophy in running a metalworking business. The basic tenets now are clear to those who expect to control their own destiny in the bright new, bitterly competitive era ahead.

The old "needs" now are becoming "musts." Greater flexibility in design and production to meet competitive product changes can no longer be ignored. The need for shorter time cycles and lower inventories is imperative. Already, old established theories of obsolescence are being knocked into a cocked hat. And the time is fast approaching when no shop can afford costly boring jigs and fixtures or the intolerable months of lead time required to manufacture them.

DE VLIEG MACHINE COMPANY, 450 FAIR STREET

plan for it . . .

New 130,000 sq. ft. Jigmil plant to be completed in June.

Fortunately, our amazing Jigmil supplies answers to many of the new "must solve" problems involved in design flexibility, time cycles, and costly inventories. Many case histories show that savings usually cover its cost in a few months. Savings resulting from reduced inventory alone often are enough.

Few people believe the claims we make for this machine. We know they sound fantastic. But 90% of the men who come to Fair Street to see a demonstration buy Jigmils.

Now while you and we have a breather period, will you come, too? Come simply to watch. The Jigmil does the selling. And we promise answers that will pay off handsomely for you—*proved in advance.* A Deferred Payment Plan is available, if desired.

FERNDALE • DETROIT 20

SOME OF OUR JIGMIL USERS

Allis Chalmers Mfg. Co.
Aluminum Co. of America
American Can Co.
American Machine & Foundry Co.
Avco Manufacturing Corp.
Barber-Colman Co.
Bendix Aviation Corp.
Boeing Airplane Co.
Borg-Warner Corp.
Brown & Sharpe Mfg. Co.
Bucyrus-Erie Co.
Cameron Machine Co.
Carbide & Carbon Chemicals Co.,
A Div. of Union Carbide and Carbon Corp.
Carrier Corp.
Caterpillar Tractor Co.
Chance Vought Aircraft, Inc.
Chrysler Corp.
Clark Equipment Co.
Continental Can Co., Inc.
Continental Motors Corp.
Control Instrument Co., Inc.
Convair, A Division of General Dynamics Corp.
Curtiss-Wright Corp.
Dana Corp.
Douglas Aircraft Co., Inc.
Eaton Mfg. Co.
Fairbanks Morse & Co.
Fairchild Engine & Airplane Corp.
Food Machinery & Chemical Corp.
Ford Instrument Co., Div. of Sperry Corp.
Ford Motor Co., Aircraft Engine Div.
General Electric Co.
General Motors Corp.
Goss Printing Press Co.
Holley Carburetor Co.
Ingersoll-Rand Co.
International Business Machines
International Harvester Co.
Jeffrey Mfg. Co.
Joy Mfg. Co.
The Glenn L. Martin Co.
National Machinery Co.
North American Aviation, Inc.
Northrop Aircraft, Inc.
The Oliver Corp.
Speco Division, Kelsey-Hayes Co.
Sperry Gyroscope Co.
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United Aircraft Corp.
Warner & Swasey Co.
Western Electric Co., Inc.
Westinghouse Electric Corp.

see the ONLY ONE of its kind

AT THE SOUTHWESTERN
METAL EXPOSITION
BOOTH 246
MAY 12-16
DALLAS, TEXAS

cost reducing!
versatile!
production increasing!
time saving!

the dixi 60 horizontal optical jig borer

(Made in Switzerland—Measurements in inches)

it combines the accuracy of the vertical spindle with the versatility of the horizontal spindle.

ACCURACY: Optical settings provide an overall accuracy of .0002"

VERSATILITY: The jig-boring art has been extended into all planes and compound angles between them with optical interrelationship all in one set up.

PRODUCTIVITY: A complete optical setting including unclamping, positioning, fine adjustment, reclamping and rechecking takes less than 10 seconds. Convenient and functional controls eliminate idle machine time.

The DIXI Optical-Reversing Process assures perfect alignment in work pieces with line bores, as well as round, taper-free holes. This is achieved by optically indexing the built-in rotary table 180°, locking the spindle feed and using the hydraulic table in-feed instead.

Write for your admission cards today to:
Butcher, Carter, & Preston
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MBI

M.B.I. EXPORT & IMPORT LTD.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery"

Field Report . . .

First US Nuclear Tanker May be Built by Ingalls Ship

Ingalls Shipbuilding Corp, Pascagoula, Miss, has contracts from the Atomic Energy Commission and the Maritime Administration for preliminary engineering and design studies for conversion of a tanker now being built by the company. Work has been halted pending decision on the nuclear power proposal.

Federal Welder to Build Westinghouse Production Lines

Federal Machine & Welder Co of Warren, Ohio, has orders from Westinghouse Electric for two fully automated lines of resistance welders and allied equipment designed for high-speed production of automatic washer tubs. Control for the lines will be handled by Westinghouse Cypak units; Federal will also build the panels.

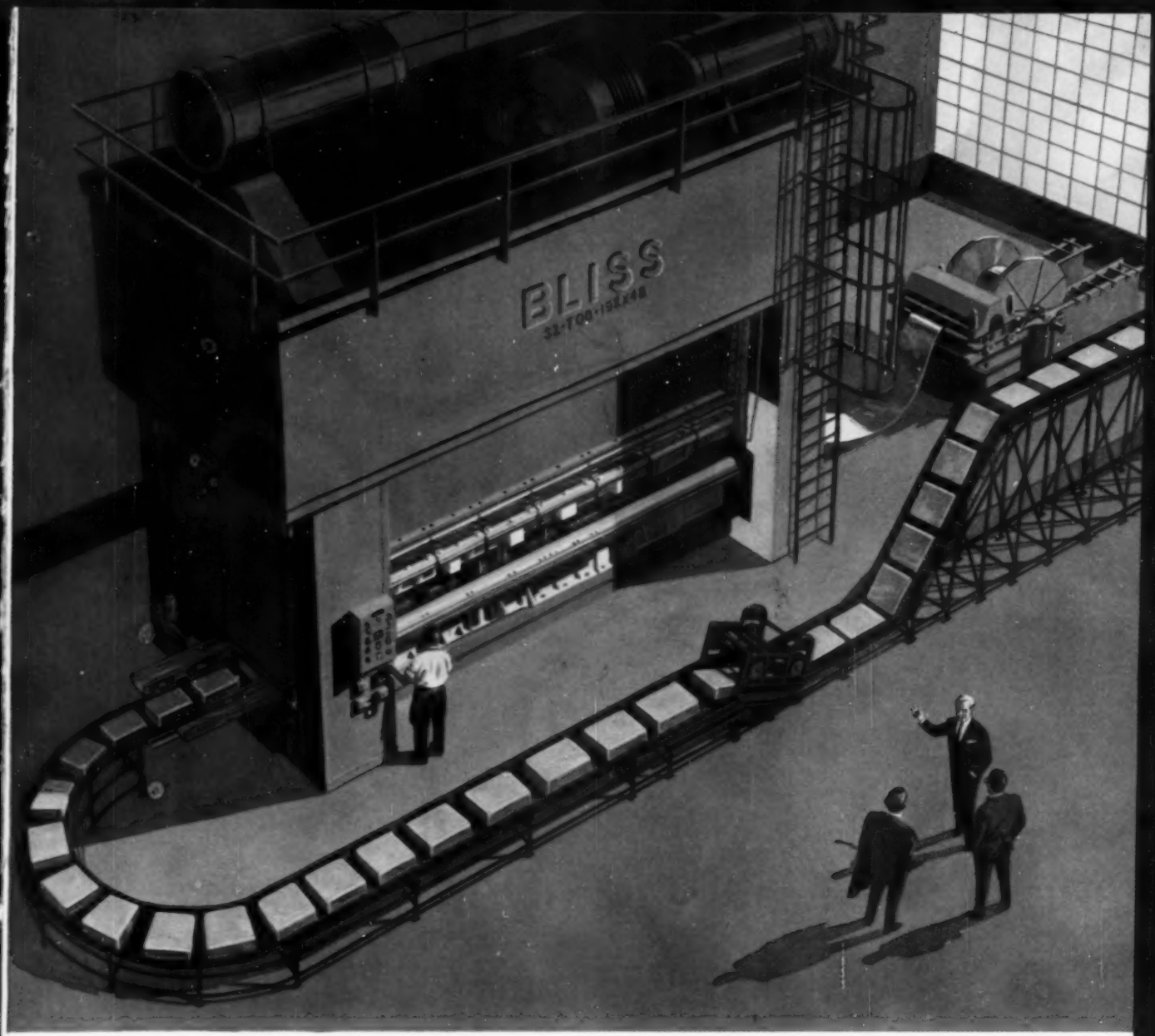
Temco Overhaul Contract

AF $1-million order for overhaul of C-54 military transport aircraft will be carried out at Temco Aircraft's Greenville, Texas, facility. Job, that'll extend into late summer, will require from 150 to 200 additional workers.

Wales-Strippit to Make Automated Fastener Tool Unit

Patented pierce nut, used currently in automobile production, and de-

"Which is the new man, as if I didn't know?"



"We get ten refrigerator pans a minute...

from one press and with one attendant!" From its motorized coil cradle to its mechanized conveyer, this is a truly automated production unit. Coil stock feeds through the press' seven transfer stations... is easily formed and drawn into deep drawn refrigerator pans. Bliss engineers design and build entire systems like these, including the dies.

Can a transfer feed press work for you? Best way to find out is to ask—ask the people who introduced them in the nineties and have pioneered in their improvement since.

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

BLISS is more than a name... it's a guarantee

PRESSES • ROLLING MILLS • BOLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

POWER CHUCKS

for more gripping power– higher production

Famous S-P cam and lever design holds the work tighter, permits cost cutting heavy feeds and multiple cuts. S-P cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure . . . an important safety factor. Balanced for high rpm.

S-P SELF-CENTERING CHUCKS are built in Universal American Standard models, sizes 6" – 8" – 10" – 12", and Serrated models in 8" – 10" – 12" sizes. Two or three jaws.

S-P COMPENSATING CHUCKS grip out-of-round work with equal pressure on each jaw. Available in 8" – 10" – 12" sizes, two and three jaw models, American Standard or Serrated.

S-P ROTATING CYLINDERS

Air and Hydraulic

Adequate stroke for long jaw travel of S-P Chucks. Balanced for high rpm on machine tools and other applications. Details in Catalog No. 105 (Air) and Bul. 201 (Hydraulic).

S-P Power Chucks are installed as original equipment by Bardons & Oliver, Cleveland Automatic, Cone Automatic, Ex-Cell-O, Jones & Lamson, Monarch, Warner & Swasey . . . and many others. Representatives in principal cities. Prompt deliveries. Send for catalog No. 105. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio.

SPecify SP

THE S-P MANUFACTURING CORP.
SOLON, OHIO • IN GREATER CLEVELAND
ESTABLISHED 1916 A BASSETT COMPANY

NON ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS
POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES, ACCESSORIES

Field Report . . .

veloped by FabriSteel Products, Inc, Detroit, will be nationally marketed for all types of manufacturing through Wales-Strippit Co, Akron, NY, tool equipment manufacturer and distributor. W-S will make an automated tool unit for applications of the fasteners for moderate and short production runs.

Convair $1-Million Contract Goes to American Electronics

Convair Division of General Dynamics Corp has order in with American Electronics Inc, El Monte, Calif, for production of ground support generators for the F-106-A supersonic interceptor. Generators, slated for initial deliveries next summer, will provide power to operate the aircraft's fire-control system on the ground.

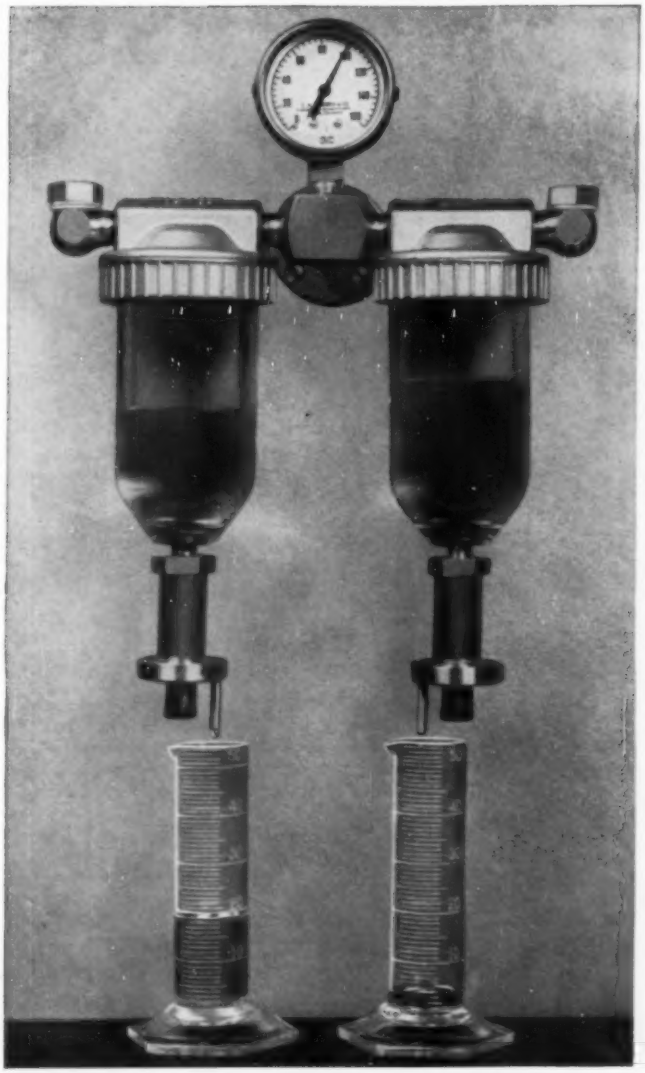
Rockwell Spring Buys Westinghouse Unit

Rockwell Spring & Axle Co, Coraopolis, Penna, has acquired the hydraulic drives department of Westinghouse Electric's Pittsburgh-based gearing division. Transaction, subject to approval of both boards, is for undisclosed amount of cash.

Leased-Machinery Figures Up Reports West Coast Firm

Boothe Leasing Corp, San Francisco company that buys metalworking equipment and other machinery for long-term lease to firms, says that

"No, No! The other way!"



ANTILEAK DEMONSTRATION

Suntac oil in one chamber, your present hydraulic oil of the same viscosity in the other. Both oils are forced out through sintered bronze bearings. In this photograph, pressure of 100 psi caused a straight mineral oil to leak out four times faster than Suntac.

SUNTAC CUTS HYDRAULIC OIL LOSS AS MUCH AS 75%

See this demonstration in your plant

Take about five minutes at your own desk to learn how Suntac® oils stay put in hydraulic systems . . . reduce oil loss through loose joints and worn fittings.

Match Suntac against the hydraulic oil you're now using—see how the exceptional non-gummy antileak characteristics of Suntac can reduce your oil losses as much as 75%. *Some users have even reported savings of 90%.*

Call Your Sun Representative

Have him arrange with a Sun Lubrication Engineer to give you and your staff a private demonstration. For further information on the uses of Suntac in hydraulic systems and in general lubrication, write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-4.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

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IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

"our Wiedemann makes duck soup of engineering changes"

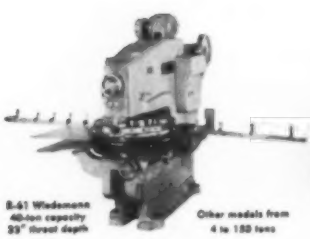
"We can't eliminate engineering changes—but now we make them at really low cost. New parts are pierced in a matter of minutes—and without disrupting the high production we expect, and get with our Wiedemann Turret Punch Press."

Wiedemann has the flexibility 'most every shop needs. Time-wasting layout and setup are eliminated. All tools normally required are in the turrets ready for use, and only one punch and die of a size is needed. When desired, the size and location of any hole(s) can be changed merely by rotating the turrets, and resetting the quick-acting mechanical work positioning gauge.

"Wiedemann savings are apparent throughout our plant—from engineering to assembly."

On-the-spot engineering changes are only one of the many ways a Wiedemann cuts short to medium run piercing costs 60% to 90%.

Get the facts. Send drawings of your work for time study, write for Bulletin 301—or



S-61 Wiedemann 48-ton capacity 33" throat depth

Other models from 4 to 150 tons

Ask any **WIEDEMANN** *User*

WIEDEMANN MACHINE COMPANY

TURRET PUNCH PRESSES

4217 Wissahickon Ave. Philadelphia 32, Pa.

Field Report . . .

cost of equipment on lease reached $17 million last year compared with less than $3 million in 1955. It expects to rent another $12 million worth of equipment this year, which would boost gross rental income for 1958 to $5 million compared with $2.9 million for 1957.

Convair Has $26 Million Order

General Dynamics Corp's Convair Div has a Navy Bureau of Ordnance contract to produce guidance and control groups for Terrier surface-to-air guided missiles. Convair developed the Terrier and is now turning it out in volume at the Naval Industrial Reserve Ordnance plant in Pomona, Calif.

Midwestern Instruments Buy 3rd Firm in 14 Months

Midwestern has bought Modern Art Metal Finishing Co of Chicago, will move it to its Tulsa home plant. Magnecord Corp was taken over and moved from Chicago to Tulsa, and last November Data Storage Devices of Van Nuys, Calif, was acquired as an operating division.

Boston Warehouser Buys Monsanto Division

Hawkridge Brothers Co, Boston, has purchased Monsanto's planishing plate division. Monsanto has been making the plates for its own use as well as for the trade for the past 20 years. Hawkridge, a major supplier of the plate, will move the

"I told Ada those weren't fresh eggs . . ."

ROUNDNESS
Honing mandrel design guarantees a perfect, geometrically round hole—corrects any pattern caused by chucking, heat-treat distortion, or previous machining.
STRAIGHTNESS
Sunnen Honing levels all internal irregularities for end-to-end precision. Corrects taper, waviness, hourglass and barrel shapes.
SUNNEN HONING
SURFACE FINISH
Produce any finish required... as fine as 2 micro-inches RMS in hardened steel... no heat checks... no smear metal.
DIAMETER
Precision sizing is quick and accurate... with production tolerances down to .0001"... to as close as .000025" if needed.
Dia. range ⅛" to 2⅛"

guarantees specified tolerances on all (4) hole dimensions

HONING ASSURES LONGER LASTING, SMOOTH RUNNING PRODUCTS

TEAR OUT COUPON NOW!

FIVE FREE BOOKLETS

They show how honing may solve your hole production problems.

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☐ Send five free booklets.
☐ Have field engineer call for free demonstration.

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SIMONDS

INDUSTRIAL CUT GEARS

LARGE OR SMALL HEAT TREATED OR PLAIN

SIMONDS has over 60 years' experience in cutting quality industrial gears. We can supply any type of gear in cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite in a full range of sizes adaptable to the material. Also heat-treated, case or flame hardened gears of carbon or alloy steel. Send us your requirements for quotation.

Custom

GEAR CUTTING

SIMONDS' facilities can produce any type of custom gear from your blanks if you prefer. Same quality . . . same prompt service.

QUALITY GEARS FOR OVER 65 YEARS

SPUR GEARS
BEVEL GEARS
MITRE GEARS
WORMS WORM GEARS
RACKS PINIONS

Also stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

SIMONDS GEARS

THE SIMONDS GEAR & MFG. CO.

LIBERTY at 25TH PITTSBURGH 22, PA.

Field Report . . .

Monsanto division's operations to a new plant in or near Boston, expects to be in operation by mid-summer.

Dana Corp Expanding Aircraft Parts Output

Dana Corp, Toledo, is stepping up activities in the airborne parts field. Company has been making precision aircraft universal joints and drive shafts at its Pottstown, Penna, division, and power plants for the Army's LaCrosse artillery missile at its Parish division in Reading. Two subsidiaries are now involved in present expansion—Atlas Drop Forge Co, Lansing, Mich, will produce forgings for Nike missiles, Bell experimental aircraft, and for C-W jet and reciprocating engines. General Drop Forge Corp, Buffalo, will turn out parts for conventional aircraft and missile assemblies.

Hiller Helicopters Takes Over

. . . Adhesive Engineering Co, San Carlos, Calif, maker of a structural high-temp adhesive for bonding metal skin of aircraft and missiles. Firm will be set up as an autonomous division of Hiller.

Diecraft Gets Missile Job

Contract for production of guidance components for the Navy's Sidewinder air-to-air missile has been awarded to Diecraft, Inc, Baltimore. Company is presently working on

(Continued on page 159)

Send us your parts

We will prove that MODERN Barrel Finishing with EXOLON gives you

1. **Accurate control of metal removal**
2. **Savings up to 80% over hand finishing methods**
3. **Consistent results — day after day**

The EXOLON Laboratory with its modern facilities and experienced personnel will be glad to help you solve your barrel finishing problems.

When sending samples be sure to include all of the information requested below. Act now, this service may save you thousands of dollars.

EXOLON Tumbling Abrasive is carefully graded in sizes from 2½ inches down to fine powders.

HOW WE CAN HELP YOU

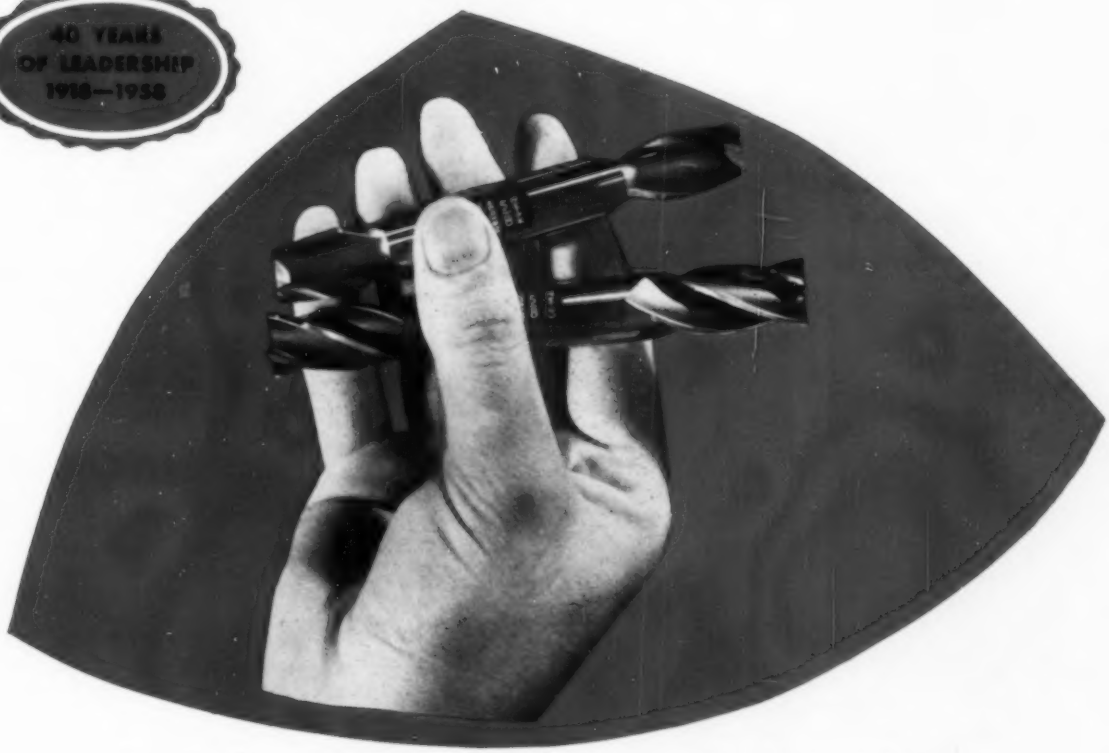
1. Send unfinished part and sample of part with desired finish.
2. Describe present finishing procedure.
3. List all special requirements.
4. What daily production is required?

The EXOLON Company
845 East Niagara Street, Tonawanda, N. Y.
Thorold, Ontario, Canada

YESTERDAY'S PIONEER . . . TODAY'S LEADER

EXPERIENCE / THERE IS NO SUBSTITUTE!

40 YEARS OF LEADERSHIP 1918—1958



40 years' successful experience as a company in the manufacture of cutting tools means that when you buy Weldon tools you are assured of the finest.

For all of these years we have consistently led the field in the origination and production of the highest quality end mills, holders and allied items.

Specialization for 40 years—that is the Weldon record—and the best of cutting tools is the result.

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you. EX2

THE WELDON TOOL COMPANY

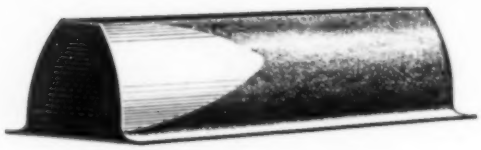
3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

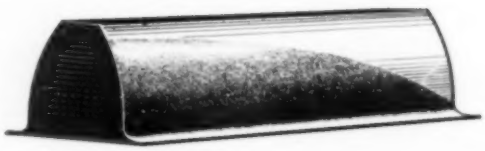
Hard Gear Honing

GIVES YOU BETTER GEARS AT LESS COST

QUICK GEAR INSPECTION

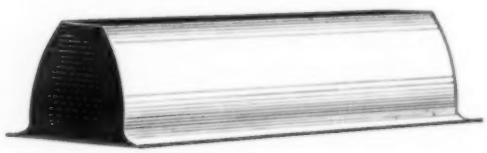
One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.





CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.



IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY

7875

parts for Army's Nike-Hercules and is scheduled to move into its new $1 million plant at Sparks, Md, by early June.

Telecomputing Corp Gets $1-Million-Plus Army Order

US Army Ordnance has ordered $1.8 million worth of nuclear warhead test equipment from Telecomputing Corp. Work will be done at the company's North Hollywood facility. Company, incidentally, hit a record first quarter sales figure for the three-month period ending Jan 31—$7,493,479.

Globe Automatic Sprinkler Acquired by Fyr-Fyter Co

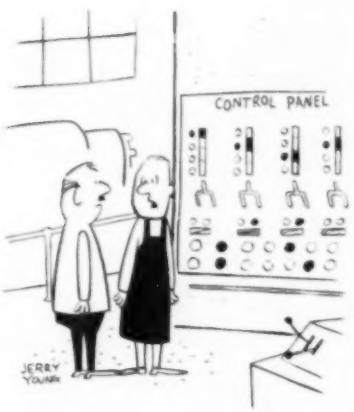
Fyr-Fyter (Dayton) Co's 1200 fire protection products now include Globe Automatic Sprinkler equipment among its brand names as result of recent purchase of the 43-year-old Philadelphia firm.

Pendleton Tool's Sales Up

Net sales of Pendleton Tool Industries, Inc, Los Angeles, totaled $17,611,419 as compared with last year's figure of $15,856,613. Net income for 1957 was $1,018,928, an 11.5% increase over the $914,115 earned in 1956.

US Chemical Milling Buys Missile Component Firm

Missile-Air, Los Angeles manufacturer of aircraft and missile components, control apparatus, and ground



"I don't need a helper. I need a companion."

6 CENTS PER DAY BUYS A LO-HED HOIST

"Although this hoist is over 32 years old, it is still doing an excellent job. Cost of maintenance is next to nothing. A recent inspection would seem to indicate that the hoist will be good for another 32 years."

Said by John Vengoechea, Maintenance Superintendent, Edgcomb Steel Company, Philadelphia, Pennsylvania, (seen on the left above, talking to Ed Boyer, Sales Manager, A-E's Materials Handling Division.

Lo-Hed Electric Hoists Cost Less Because They Last Longer

Based on current prices, this Lo-Hed Hoist at Edgcomb Steel shows a capital cost of less than 6 cents per day... and it looks like it will still be going strong in 1990.

There's A Lo-Hed Electric Hoist Exactly Right For Your Application

Just give us the details! Lo-Hed's are available with headrooms as low as 11"; capacities ¼ to 12 ton; all control types, two-speed included; 5 suspensions; also adaptable to any crane or monorail system; shrouded bottom block; 2 automatic brakes, anti-friction bearings throughout, full load tested. Look in your classified telephone directory under "A-E Lo-Hed Hoists" for your nearest representative.

For helpful information on hoists, fill out and mail this coupon today.

Please send me a copy of your booklet on:

☐ "How to select the proper hoist to meet your needs."

☐ "Five things to consider before you buy that hoist."

Name .....

Position .....

Company .....

Address .....

City ..... Zone ..... State .....

(H171)

DISTRIBUTORS AND AGENTS: Distributorships and agencies for Lo-Hed Electric Hoists are available in many parts of the country. If you are interested, call or write Ed Boyer, Sales Manager, A-E's Materials Handling Division.

AMERICAN ENGINEERING COMPANY

Wheatsheaf Lane and Sepviva Street
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Branch Offices: Jersey City • Cleveland • Chicago

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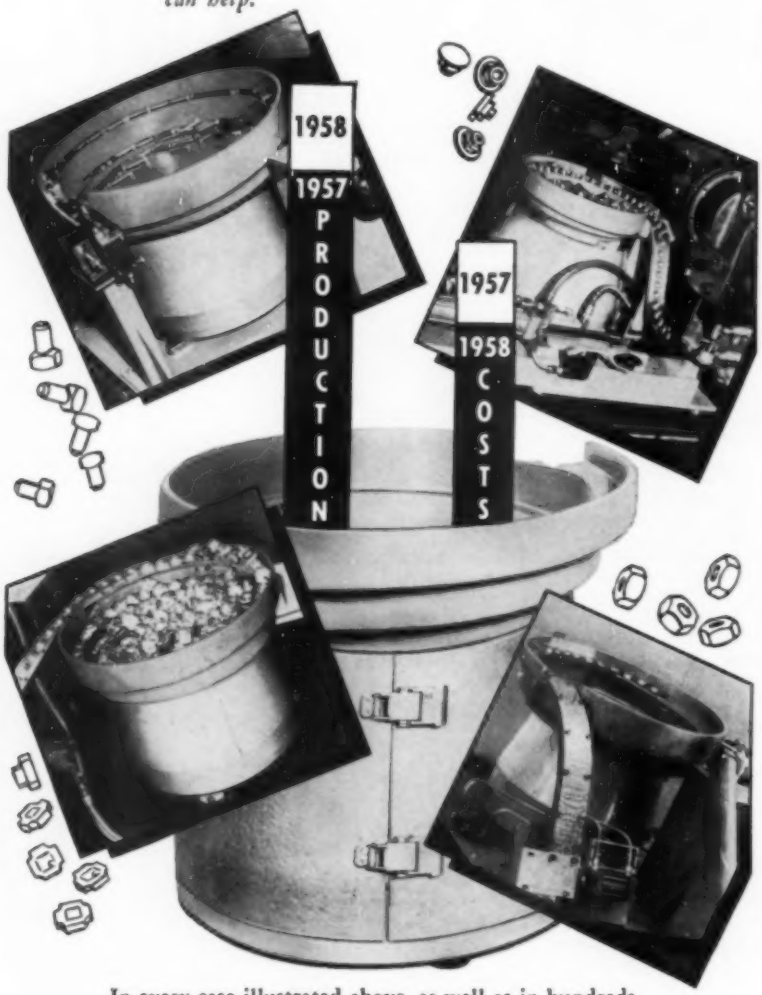
AE Products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries

the shortest route to MORE PROFIT
. . . produce MORE in 1958!

If you can reduce costs while producing more, the job is twice as easy. This is where PEECO can help.



In every case illustrated above, as well as in hundreds of other examples, PEECO successfully helps production men reduce their costs by producing more—automatically.

If your equipment, machinery, production or assembly line is *not* now using parts feeders the chances are your costs are too high. Let a PEECO Sales Engineer give you the facts. He'll gladly help you without obligation. Write for literature and name of representative near you.

We'll be watching for you at the TOOL SHOW—Booth 1414.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF VIBRATORY PARTS FEEDERS

Peeco DIVISION... AUTOMATION DEVICES, INC.

32nd & BRANDES STS., ERIE, PA. • PHONE 4-6329

IN CANADA 96 KIPLING AVE. NORTH, TORONTO 18, ONT.

handling equipment, has been taken over by US Chemical Milling Corp, Manhattan Beach, Calif, as part of a planned series of diversification by acquisition of a number of metalworking companies.

Convair Astronautics Div Moving

7000 Astronautics' employees are moving gradually into the new $40 million plant at Montgomery Field in northeastern San Diego, Calif. Convair has put some $20 million into the 252-acre plant site including six primary and nine smaller auxiliary buildings; Air Force is installing $20 million worth of machine tooling and other heavy equipment. Astronautics is in pilot production on the Atlas ICBM.

Milford Rivet & Machine Co Sets Up Research Lab

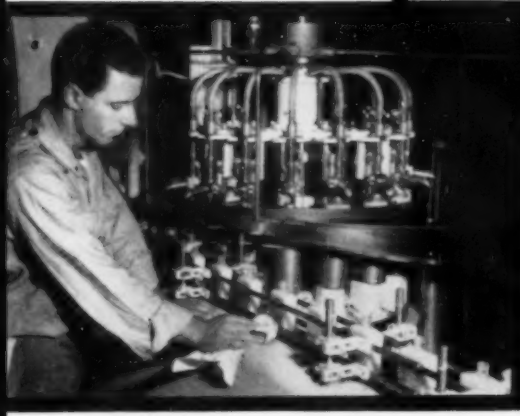
Research laboratory established by Milford Rivet & Machine Co, Milford, Conn, will work on new methods and product development as well as improvement of manufacturing equipment and techniques, particularly in cold forming of metals. New building is equipped with complete toolroom facilities, a range of standard production cold headers, and secondary machines which will be used for experimental and development work.

American Optical Acquires Patwin Instrument Line

American Optical Co, Buffalo, has taken over the line of analytical instruments of Patwin Instruments, a

people buy Scott Wipers for many reasons:

Mr. Arthur Schute (right), Plant Manager at Revlon, says: "Scott Wipers are soft and absorbent, yet strong. We use them on production lines, filling lines, for cleaning ink from coding machines, for wiping oil and grease, and of course our employees use them for wiping hands and face."



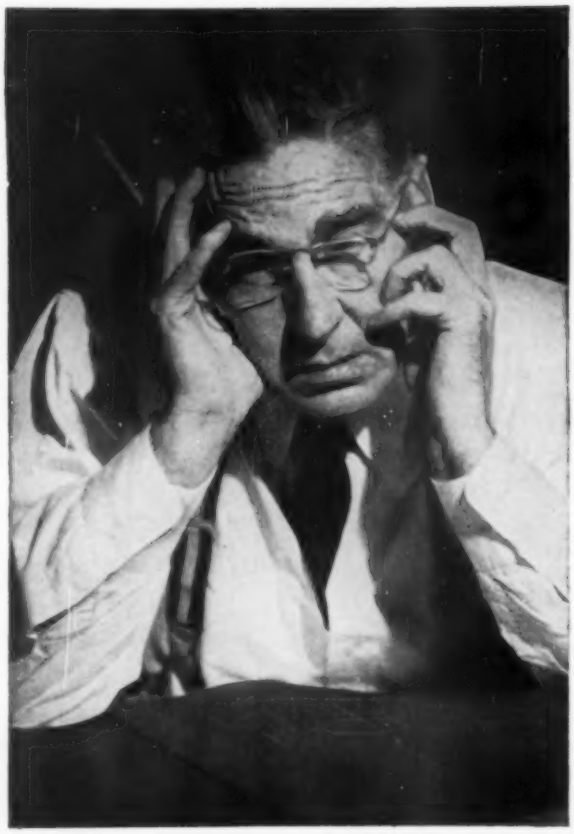
Revlon saves $4,000 annually with Scott Wipers!

Revlon, Inc., at Passaic, N. J. has used Scott Wipers for about 15 months . . . for personal wiping, equipment wiping and miscellaneous clean-ups. Benefits: a high degree of sanitation in packaging operations and overall savings of $4,000 annually in wiping costs. Scott Wipers have eliminated the costs of cloth wiper distribution, collecting, sorting and laundering . . . are merely issued, used and tossed into handy receptacles.

SCOTT PAPER

Get the complete Revlon case history, with cost figures, from your Scott distributor. He's in the Yellow Pages under "Paper Towels." Or write: Scott Paper Company, Dept. AM-84, Chester, Pa.

Makers of the famous Scott paper products you use in your home. See "Father Knows Best" on NBC-TV.



send it out to CDT

There is no faster, more reliable way to get help with difficult tooling problems than to send it to Columbus Die-Tool. Backed by 50 years of experience, CDT has three basic objectives when designing and building tools, jigs, fixtures or special machinery.

1. Increase Production
2. Improve Quality of Product
3. Lower Production Costs

These and other benefits are reasons why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool. Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

Field Report . . .

division of the Patent Button Co, Waterbury, Conn. Inventory and engineering data for Patwin recording and manual electro-polarizers have been acquired outright; option to buy company's flame photometer is included in terms of purchase.

Micromatic's Diesel Operation Sold to Allis-Chalmers

Diesel fuel injection systems made by Micromatic Hone Corp's Micro-Precision Division at Evanston, Ill, have been sold to Allis-Chalmers Tractor Group. Machinery, equipment, inventories, and patents will be transferred to the A-C plant in Harvey, Ill. Custom aircraft components operations, also located at Evanston, will be moved to Micromatic's Los Angeles division.

Palmer-Bee Forms New Division

Palmer-Bee Co of Bloomfield Hills and Marysville, Mich, has set up the Autocon Division to fabricate custom electrical control panels for conveyors and machine tools and to design and engineer completely integrated electrical control systems. Division is located at 1929 Opdyke Rd, Pontiac, Mich.

GE to Build Diesel Locomotives?

General Electric is reported to be sounding out the railroad industry on its reaction to GE's complete entry into the domestic diesel-electric locomotive picture. Firm has been supplying electric generators, traction motors, and switchgear to railroad locomotive manufacturers. It's also made locomotives for export and is currently building about 30 gas turbine units for Union Pacific.

"Butterfork!"

This Rodgers Platen Press Draws

800 STEEL HOUSINGS A DAY

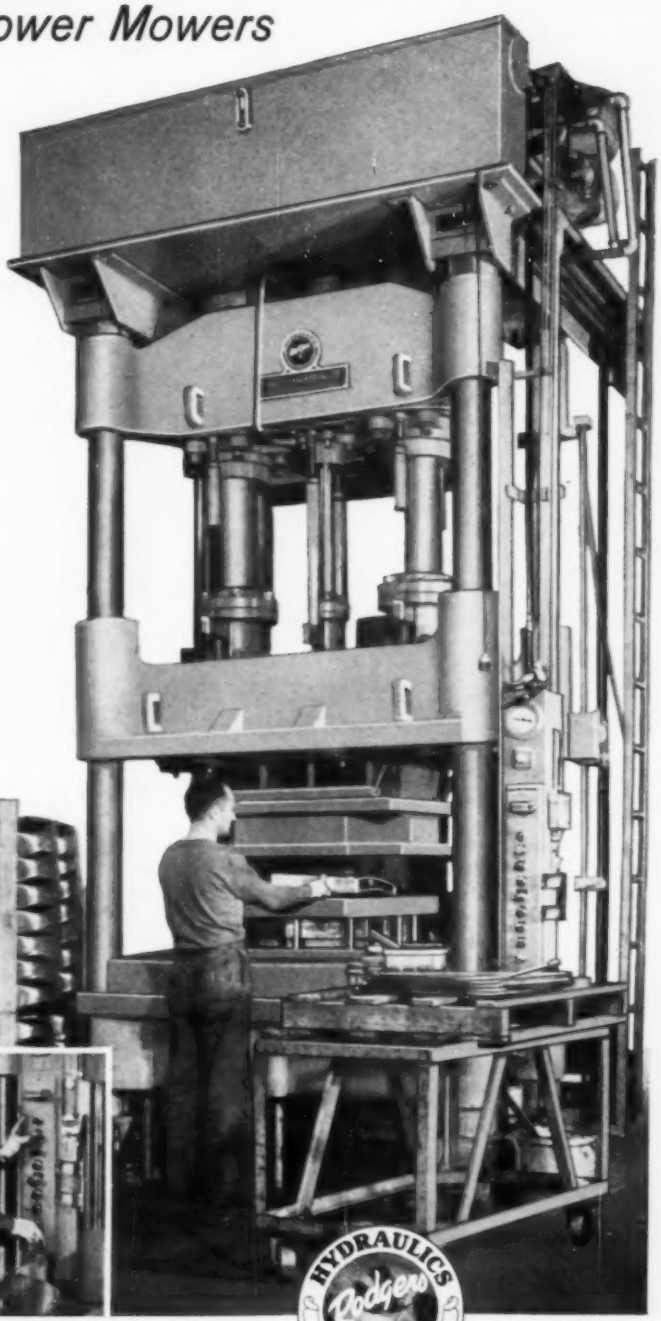
for Foley Power Mowers

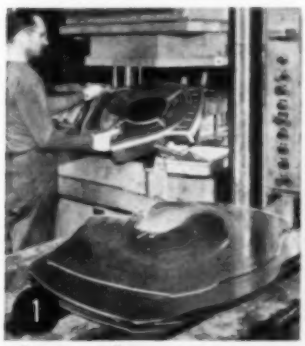
Designing a light power mower to give heavy duty service and at the same time sell for an economy price takes a lot of engineering and production efficiency. The Foley TARTAN, with a cold-rolled steel housing formed on a Rodgers Platen Press, is the answer of Foley Manufacturing Co. to this problem.

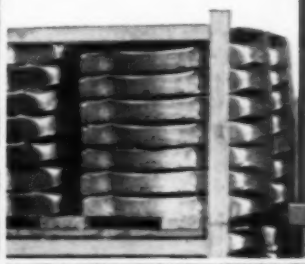
The Rodgers 400-ton Platen Press handles three operations on the Foley lawn mower housings. First, it blanks the flat stock to the proper 27½" x 28⅞" shape. Second, it makes the draw as shown in the photo. Third, it pierces all the holes and final trims ready for assembly.

A fast approach and return of the platen makes it possible to draw the 14 gauge cold-rolled steel blank at a production rate of 100 an hour. Working at 190 tons pressure, the machine makes a smooth draw on a pneumatic die cushion. Accurate clamping pressure over a 48" x 60" platen provides smooth, even forming and extra capacity when needed.

If you have an operation requiring a platen press, write for bulletins on Rodgers Platen Presses from 50 to 500 tons.







1 **Rodgers Platen Press** turns out 100 lawn mower housings per hour of 14 gauge cold-rolled steel at the Foley Manufacturing Co. plant.

2 This is the Foley TARTAN, an economy 1¾ HP rotary lawn mower with a heavy duty steel housing blanked, drawn and pierced on a Rodgers 400 ton platen press.

3 Both of the operator's hands are required on controls during the drawing operation—a safety factor.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

Rodgers Hydraulic Inc.

7407 Walker St., Minneapolis 26, Minn.

MONEY-SAVING MAGIC IN THIS "HEEL AND TOE"

This Tinnerman fastener is modeled after your foot . . . there's a heel and toe . . . it slides easily into the holes punched in the metal, fiber, or plastic, even as your foot slides into a shoe. But it is much easier to put on than to take off!

The primary function of this SPEED NUT fastening principle is to provide a fast, easy-to-apply, low-cost, self-retaining fastener. Its snap-on attachment feature requires little skill and no welding or staking. Yet it assures positive retention for center panel or blind locations.

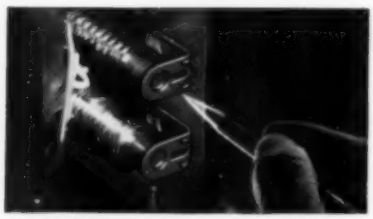
Tinnerman "heel-and-toe" fasteners can also have a wide variety of fastening features. The self-retaining heel-and-toe can be combined with the famous Tinnerman SPEED NUT impression. Or with a speedy cable clip . . . or a spring catch . . . a molding clip . . . a wire retainer . . . almost any fastening idea you require.

Tinnerman sales engineers are ready to make a SPEED NUT Analysis of your fastening requirements. Or you can write to us for details and engineering data. *Tinnerman Products, Inc., Box 6688, Dept. 12, Cleveland 1, Ohio.*

TINNERMAN
Speed Nuts
FASTEST THING IN FASTENINGS®

On dictating equipment, this SPEED CLIP® holds wires safely away from moving parts.

SPEED CLIPS secure molding on plastic sign, help manufacturer gain 48% assembly saving.



Assembly of TV tuning coil to chassis and servicing simplified with special SPEED CLIP.

G M Stickell, vice president and general manager of Landis Machine Co, has been elected president and general manager (additional appointments below)

Frank J Phillips, sales manager of Cyril Bath Co, has been appointed vice president and general manager

T S Pacer, vice president of Illinois Gear & Machine Co, Chicago, has been elected executive vice president

NAMES IN THE NEWS...

J H Elliott, former president of Landis Machine Co, Waynesboro, Penna, has been appointed chairman of the board and vice president. **R E Yingling** has been named director of sales. **D Roy Stoner, Jr,** succeeds Mr Yingling as domestic sales manager. **A R Margin** has been appointed assistant export manager. Other appointments: **L M Hess,** from treasurer to treasurer and assistant controller; **L H Randolph,** works manager, main plant; **F Nell,** works manager, tap division; and **R I Eyler,** plant engineer.

William F Boyle, general manager of the Pelton Division, San Francisco, of Baldwin-Lima-Hamilton Corp, has been named general manager of the Hamilton Division, Hamilton, Ohio. Mr Boyle is a B-L-H vice president. He succeeds **Walter A Rentschler** who has resigned as Hamilton general manager but will remain a vice president of the corporation. **Ira Morgan White,** chief engineer at Pelton, has been elected a B-L-H vice president and named to succeed Mr Boyle as Pelton general manager.

Paul W Christensen, Jr, has been elected president of Cincinnati Gear Co. Formerly vice president, he succeeds his father, **P W Christensen,** named treasurer and board chairman. Elected vice presidents: **Walter L Rye, Jr,** manufacturing; **Anthony J Lucas,** engineering; and **Lester A Edwards,** sales.

Charles W O'Connor has been appointed general manager of the Octigan Forge Division of H & B American Machine Co, Chicago. He was formerly H & B controller.

Carl S Saltzman has been named manager of the new Control Systems Co, Division of Hancock Industries, Jackson, Mich. Company makes an electro-mechanical production control system recently developed by Hancock. Mr Saltzman was formerly national sales manager of Underwood Corp's Electronic Computer and Data Processing Division.

William H Hendrickson, Jr, executive vice president of Welding Engineers, Inc, Norristown, Penna, has been elected president of the company to succeed **John B Hendrickson,** named board chairman.

Vance T Wray has been appointed manager of Chrysler Corp's McGraw Stamping plant in Detroit. He has been serving as manager of the Youngstown, Ohio, plant.

Lew Murray has been appointed manager of the contract department of Clearing Machine Corp, a division of US Industries, Inc. He was formerly supervisor of the methods department.

Hugh Brunner has been named to the new post of assembly plant manager at Square D Co's Cedar Rapids, Iowa, facility. He was formerly production manager there.

Carl F Stugard (left) has been elected a vice president of Cincinnati Milling & Grinding Machines Inc, sales subsidiary of Cincinnati Milling Machine Co. He is manager of the Special Machine Tool Division. **Carl Schonhoft** (center) has been appointed manager of grinding machine sales, and **Curtis Altbaier** manager of special machine tool sales

This is no time for guessing games!

It's much simpler to look for the supplier in your **American Machinist** Production Planbook and Buyer's Guide. If you want the source of any machine, part, tool, material or supply item, the Buyer's Guide will give you the answer — fast!

Over 1,600 separate classifications list the products of some 3,000 manufacturers. And each listing is complete with firm name and address. There's plenty of cross-indexing too, to help you find exactly the product you're hunting.

Your Production Planbook and Buyer's Guide can be helpful in solving production problems as well. Just turn to one of the 11 thumb-indexed sections of this big 640-page reference issue and check the Production Nuggets. Stripped-down, self-contained summaries of material from **American Machinist**, each Nugget refers you to a specific issue — if you want further information.

For fast facts in today's Metalworking production problems, turn **first** to your

American Machinist

1958 PRODUCTION PLANBOOK AND BUYER'S GUIDE ISSUE

NAMES IN THE NEWS...

John F Strickler, Jr, has joined Boeing Airplane Co at Seattle as assistant to the vice president and general manager of the pilotless aircraft division. He was formerly research manager and executive chief engineer for Bell Aircraft in Buffalo.

Louis J Pedicini has been named manager of manufacturing engineering of Congress Die Casting Division and Congress Drives Division of the Tann Corp, Detroit. He was previously staff engineer in charge of General Motors metal casting department.

Karl A Wildason has been appointed sales manager of Hohman Plating & Mfg. Inc, Dayton, Ohio. Prior to joining the company he was cofounder and operator of the Dayton Re-New Tool Co.

Frank H McCrohan has joined Volkert Stampings, Inc, Queens Village, LI, NY, as assistant to the plant manager. He was formerly associated with the product development laboratory of Sylvania Electric Products.

Frank S Nelson, assistant plant manager of Federal Pacific Electric Co's Newark, NJ, manufacturing operation, has been named manager of the Scranton plant. **Bernard G Tremblay,** engineering manager at Newark, succeeds Mr Nelson.

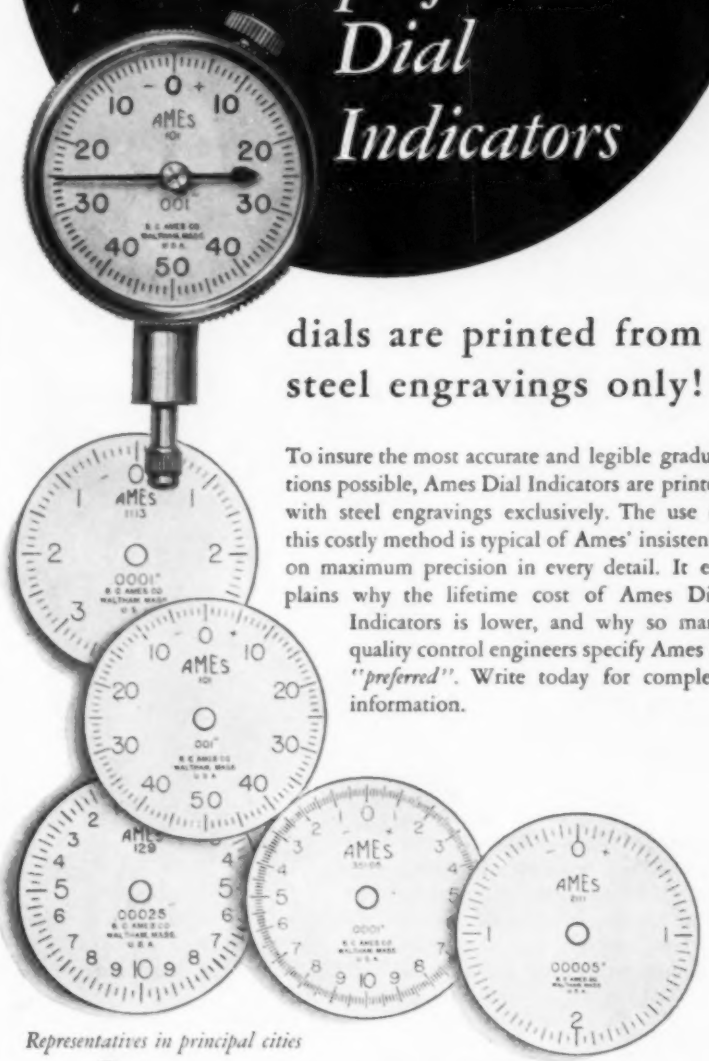
Roy Blasiola, manager of Chrysler Corp's Mack Avenue Stamping plant in Detroit, has been named manager of the Ohio Stamping plant at Twinsburg. **Wilfred T Hanlon,** manager of the Ohio facility, moves to the Outer Drive Stamping plant in Detroit. **Walter B Connolly,** formerly Outer Drive manager, takes over Mr Blasiola's post at the Mack Avenue unit.

Victor Brown, executive vice president of Kropp Forge Co, Chicago, has been elected president and general manager of Kropp Steel Co, Rockford, Ill, subsidiary.

Willard J Harper has joined Hanson-Van Winkle-Munning Co, Matawan, NJ, as chief mechanical engineer. He was formerly associated with Westinghouse Electric's hydraulic drives department. **Donald G Dutcher** has joined the company as

AMES

...the preferred Dial Indicators



dials are printed from steel engravings only!

To insure the most accurate and legible graduations possible, Ames Dial Indicators are printed with steel engravings exclusively. The use of this costly method is typical of Ames' insistence on maximum precision in every detail. It explains why the lifetime cost of Ames Dial Indicators is lower, and why so many quality control engineers specify Ames as *"preferred"*. Write today for complete information.

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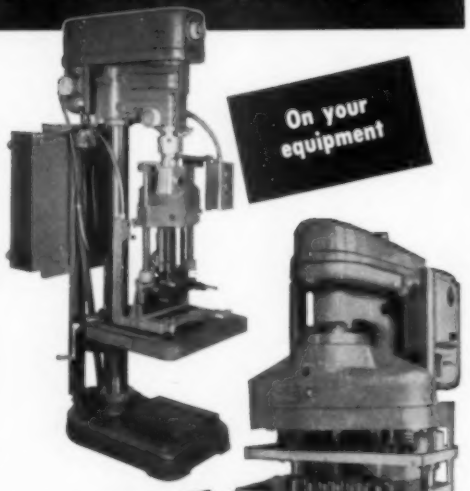
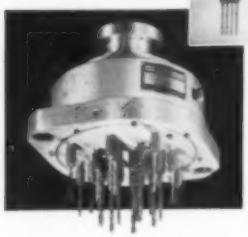
MANY Drilling and Tapping Heads **ARE BETTER THAN ONE!**

...let ZAGAR solve your problems



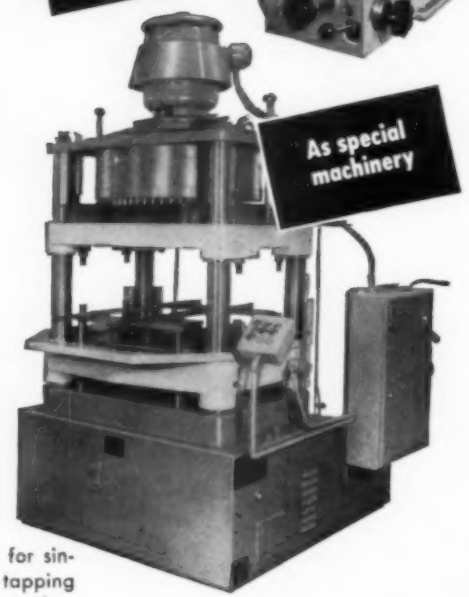
On your equipment

HOLES—any number, any pattern, any material, on ALL CENTERS can be drilled, reamed, or tapped with a Zagar head. Several shapes to fit your job.



As a completely tooled package

Up to 1200 holes can be drilled at one pass.



As special machinery

Simultaneous spindle rotation for single-pass drilling, reaming, or tapping assures highest piece per hour production. The Zagar method is also profitable on intermittent, low production runs. Centers as close as sum of hole diameters is standard practice. Capacity up to 1½" hole diameter. Your print will bring a prompt quotation.

Ask for Data Sheet "A-4" containing detailed engineering information.

Zagar

ZAGAR, INCORPORATED
23886 LAKELAND BLVD.
CLEVELAND 23, OHIO

TOOLS FOR INDUSTRY and SPECIAL MACHINERY

NAMES IN THE NEWS...

chief electrical engineer. He held a similar position at W F and John Barnes Co.

Chris F VanRaaphorst, formerly plant superintendent of the Waterbury Manufacturing division of Chase Brass, has joined Bridgeport Brass Co as manager of its Norwalk, Conn, plant.

E F Greiwe has been appointed manager of the Norwood Works centrifugal pump department of Allis-Chalmers, succeeding **M L Murdock** who has resigned. Mr Greiwe was previously manager of product sales, electrical department, Norwood Works.

John W Black has been appointed plant manager of the Tucson, Ariz, operations of Hughes Aircraft Co. **Louis L Reasor,** manager of services, succeeds Mr Black as assistant plant manager.

William R Roberts has been named manager of engineering for Lamson Mobilift Corp, Portland, Ore.

T Ross Welch has been made general manager of T C Components Division of Brubaker Electronics Co, Los Angeles subsidiary of Telecomputing Corp. Mr Welch was formerly director of research and development for Elgin Watch Co's Electronics Div at Burbank.

Abraham I Dranetz has been named a vice president of Gulton Industries, Inc, Metuchen, NJ. He will, in addition, serve as general manager of the newly created Glennite Instrumentation Division. Mr Dranetz was

"Yeah, I can fix it. Where's the switch to turn it on?"

FYI

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To get the ones you need just list number of each booklet described on this and the following pages. When you have filled out card, simply detach and mail. We'll do the rest Postage is prepaid.

MACHINES AND ATTACHMENTS

● CONTOUR CONTROLS — *Monarch Machine Tool Co, Sidney, Ohio.* 20-page bulletin 2402 illustrates and describes latest Monarch-Keller tracer control system applicable to wide range of Monarch production lathes including Series 42, 60, and 90 models. System enables machine to perform complicated contouring operations automatically in a single, continuous cut, using a thin metal templet as guide. Request direct on company letterhead.

1 DISK GRINDERS—*Gardner Machine Co, Dept 81, Beloit, Wis.* 24-page condensed, illustrated, general catalog CG-58 covers basic types of flat surface disk grinders, work carrying fixtures, variety of shapes and sizes of work ground, automation in disk grinding, and sizes and types of faces of abrasive disks.

2 ELECTROLYTIC CARBIDE TOOL GRINDERS — *Hammond Machinery Builders, Inc, 1616 Douglas Ave, Kalamazoo, Mich.* 8-page catalog 255 gives data on oscillating, chip breaker, and cup wheel grinders; describes new vises and fixtures for regrinding of throw-aways, single point tools, and insert slugs. Typical examples of grinding times tabulated.

3 STRAIGHT LINE INDEXING MACHINE CHASSIS — *Swanson-Erie Corp, 814 E 9th St, Erie, Penna.* 8-page booklet contains information on Auto-Tran units that can be used as basis for a completely automatic special machine or as a transfer machine. Describes features, illustrates optional accessories, gives dimensional details, index time, cycling data.

4 COLD ROLL FORMING—*Yoder Co, 5500 Walworth Ave, Cleveland 2, Ohio.* 88-page reference manual discusses economics, mechanics, and applications of process to various sized manufacturing operations, plus data for selecting correct size and capacity of equipment. Production costs, operating speeds, tooling, surface finish, uniformity, forming of pre-coated stock, operating techniques illustrated and described.

5 RED-E CENTERS AND GRINDER DOGS—*Ready Tool Co, 150 Garfield Ave, Stratford, Conn.* 20 page illustrated catalog CD-58 covers full line including new items recently added. Each classification listing has data for determining correct grinding machine tapers, gage line clearance requirements, taper specifications for lathes. Grinder centers and tables of load ratings for each type also listed.

TOOLS AND ACCESSORIES

● "MASTER MANUAL OF CUTTING TOOLS"—*Morse Twist Drill & Machine Co, New Bedford, Mass.* Heavy, durable binder contains separate, self-covered sections on each type of Morse tool; each section contains all pertinent data, including price. Supplementary material will be forwarded as it is issued. Manual must be requested on cards available from Morse salesmen or franchised distributors.

6 HYDRAULIC OILS—*Sun Oil Co, 1608 Walnut St, Philadelphia 3, Penna.* 44-page revised technical bulletin H-4 discusses principles of hydraulic systems, with illustrated explanations of most important types of valves, pumps, motors, torque converters, and accessories. Explanation of important oil characteristics is followed by sections on oil selection and trouble-shooting.

7 TOOLROOM GRINDING WHEELS —*Cincinnati Milling Products Division, Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* Brochure PG-350 describes and pictures features and applications for both general toolroom and cutter and tool grinding. Contains complete table of starting grades for wide range of operations.

8 VISES AND WORKHOLDING FIXTURES—*Universal Vise & Tool Co, Parma, Mich.* 14-page catalog 9186 gives illustrated descriptions and specifications of mill, machine, quick-acting, and 3-way vises; adjustable lathe fixtures; workholders for drillpresses; rotary table; adjustable angle plates; and parallel clamps.

9 METALWORKING SOLUTIONS—*F E Anderson Oil Co, Portland, Conn.* Illustrated brochure describes Lusol line of water-based products including im-

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FOR YOUR INFORMATION

proved Lusol (combination coolant, cleanser, rust-preventive, water conditioner); K-7 for grinding operations; Shamrock, a combined coolant and lubricant; Unikool cutting fluid.

10 AIR GAGE MEMBERS — *Freeland Gauge Co, 9340 Freeland Ave, Detroit 27, Mich.* 20-page catalog 357 is general reference and order guide to air gage members for all major circuits including back pressure, flow type, and differential types. Tabular data and illustrations cover broad range of standard and special members designed to fit air gage instruments of every make and type currently known.

11 TOOLS—*Dunn Tool Industries, Inc, Bridgeport, Mich.* 22-page illustrated catalog 12 contains descriptive and dimensional data on reamers, end mills, cutters, twist and spade drills, centerlaps, burs, boring tools, and files.

12 CUTTING TOOLS—*Severance Tool Industries Inc, 3765 Olive, Saginaw, Mich.* 42-page catalog 23 illustrates and describes complete line of high-speed and carbide tools. Booklet is indexed and divided into color sections for easy location of tool desired.

13 PNEUMATIC COMPARATOR GAGES—*Moore Products Co, H & Lycoming Sts, Philadelphia 24, Penna.* 8-page bulletin pictures and gives details on features of new air gages with Hardcoat pneumatic gaging plugs, 2-dimension master ring, and set-lock mounting.

14 CARBIDE GRADE—*Vascoloy-Ramet Corp, Waukegan, Ill.* 12-page bulletin 5712 contains data on VR 75, a new shock and heat resistant grade of carbide for heavy work. It is available in full length inserts, throw-away inserts, standard blanks and most styles of standard tools.

HEAT TREATING AND WELDING

15 FLAME-CUTTING MACHINES—*Linde Co, Division of Union Carbide Corp, 30 E 42nd St, New York 17, NY.* 28-page catalog (Form 4487) describes line of Oxweld units ranging from small portable models to large multi-blowpipe shape-cutting machines. Includes complete specifications, illustrations of typical installations, description of accessories, such as automatic and magnetic tracing units.

16 FLASH-BUTT WELDERS—*Taylor-Winfield Corp, Warren, Ohio.* 16-page bulletin 7-913 discusses process, outlines and illustrates types of clamping and flash and upset mechanisms. Forty models designed for specific applications are pictured and described.

17 ARC WELDING CABLE CONNECTIONS AND ACCESSORIES—*Tweco Products, Inc, PO Box 666, Wichita, Kans.* 12-page Twecolog 11 describes and illustrates complete line.

PLANT SERVICE EQUIPMENT

18 FINISHING EQUIPMENT—*Mecha-Finish Corp, South St, W. Sturgis, Mich.* 12-page catalog covers complete line, plus processing media and compounds to be used with it. Mechamatic machines are designed to provide volume production finishing of parts too large, too intricate or delicate for other methods.

19 ELECTRIC HOISTS—*American Engineering Co, Wheelabrator Lane & Sepviva St, Philadelphia 37, Penna.* 37-page catalog H-56 provides both general and detailed information on Lo-Hed Monorail line available in five classes for lifting anything from ¼ to 12 tons. Selection pointers; hoist data and types of controls available tabulated; engineering details and specifications; installations pictured.

20 HYDRO-BOOM TRUCK—*Vanguard Engineering Co, 1908 E 66th St, Cleveland 3, Ohio.* 4-page illustrated bulletin describes Model 110 which, with powered hydraulic action, enables operator to position the boom within 1/100 in. of desired load location. Boom extension from truck front is 48 in. max; load capacity at max extension, 1500 lb.

PARTS AND MATERIALS

21 STANDARD WORM AND GEAR MOUNTINGS — *Cone-Drive Gears, Division Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 20-page illustrated bulletin 750-C gives details on mountings (including bearings, caps, carriers, seals, etc) for double-enveloping worm gearsets. Assemblies, which may be used in either standard Cone-Drive speed reducers, or in custom-designed equipment, are suitable for either single- or double-extended shafts, and for either worm over, worm under, or gear shaft vertical installations.

22 ROLLER DIE, COLD FORMED METAL SHAPES—*Van Huffel Tube Corp, Warren, Ohio.* 48-page handbook MS 158 explains and illustrates basic principles. Material selection, roller dies, forming mills, tolerances for roll forming, and typical metal shapes covered.

23 FLUID POWER DRIVES—*Odgear Co, 1560 W Pierce St, Milwaukee 4, Wis.* 32-page illustrated bulletin 10600 discusses advantages, operation, and characteristics of Any-Speed drives, illustrates them with typical performance curves and block diagrams on different types of rotary applications. Applications described include gear hobbing, and rotary and lateral welding.

● PRECISION INSTRUMENT COMPONENTS—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY.* 128-page catalog 14 lists over 4000 stock components including gears, shafts, collars, differentials. Includes specifications and technical data on instrumentation.

24 TOOLING PLASTICS—*Furane Plastics Inc, 4516 Brazil St, Los Angeles 39, Calif.* 4-page bulletin describes use of epoxy resins. Basic materials required for manufacture listed, as well as basic procedures; applications of Epocast tools included.

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formerly director of engineering. **Bernard Bernstein** has been appointed general manager of the new Advanced Development and Systems Division. He was previously chief of the ordnance systems department.

Dr D W Elam has been elected a vice president of Hiller Helicopters, Palo Alto, Calif, following Hiller's acquistion of Adhesive Engineering Co, founded by Dr Elam. Company will operate as a separate division of Hiller.

J R Whiteside, executive vice president of Simpson Electric Co, Chicago, has been elected president.

John A Kirk has been appointed vice president, production, of American Coils Co, Farmingdale, NJ. He was formerly assistant to the executive vice president.

Wright A Parkins, engineering manager of Pratt & Whitney Aircraft division of United Aircraft, has been elected vice president, engineering, of United. **Leonard C Mallet,** general manager of P&W's Connecticut operations, has also been elected a vice president of the corporation.

E E Saloum has been named chief engineer for Snap-Tite, Inc, Union City, Penna, manufacturer of quick-connect couplings.

F R Cruse has been promoted from assistant sales manager to sales manager of Wall Colmonoy Corp's Stainless Processing Division.

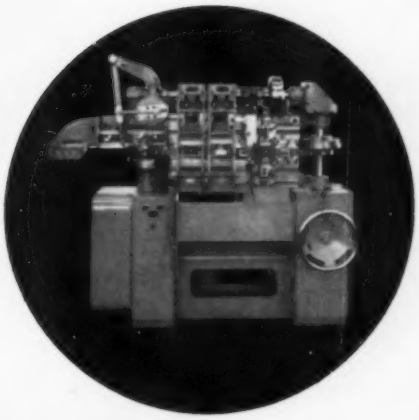
C F Smith has joined Sterling Precision Corp, Port Washington, LI, NY, as components sales manager of the Instrument Division.

John F Wilson, general manager of marketing for Metals & Controls Corp, Attleboro, Mass, has been elected vice president, sales.

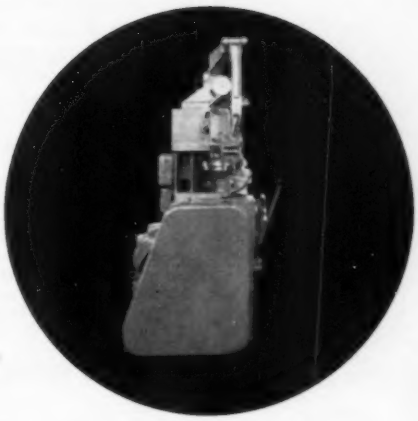
B E Meyer has been named manager of can machinery sales of E W Bliss Co, Canton, Ohio. He was formerly chief sales engineer of the division. **James E Paumier** has joined Bliss as general superintendent of the Canton Division.

Wayne D Staley, vice president of the Duriron Co, Dayton, Ohio, has been elected president of the Hydraulic Institute.

William L Parlon has joined the Onsrud Cutter Manufacturing Co, Libertyville, Ill, as sales manager.



VERTICALITY = SETUP TIME / 2



The big story of the important new line of Torrington vertical 4-slides is savings:

Upward of 50 percent savings in setup time, tooling costs and floor space!

On a strict cost-accounting basis, you cannot afford not to investigate the profitability of replacement with the Torrington "Vertical Line" in the cost-critical field of wire and strip forming production equipment. Full data—or a demonstration—upon request.

THE TORRINGTON MANUFACTURING COMPANY

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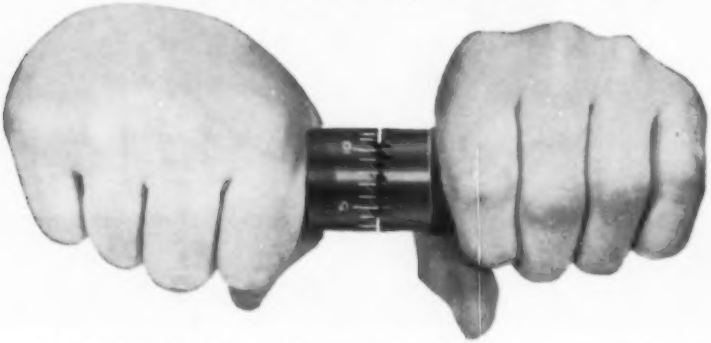
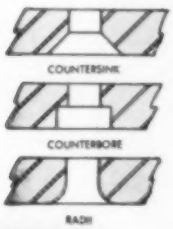
MICRO-SET ACCURACY

with a twist of the wrist



Cogsdill hole finishing tools are designed to meet many precision manufacturing requirements. To assure Cogsdill customers of precision results, these tools contain a micro adjustment feature, which permits the user to adjust the tool within .001" . . . WITH A TWIST OF THE WRIST.



Pictured at left are three of the most common hole finishing situations. These can be accurately controlled on either front or reverse surfaces, working from whichever surface can be presented to your spindle most conveniently. In addition to these typical problems, Cogsdill tools can be designed for some facing and grooving operations . . . all incorporating the micro adjustment feature for greater finishing accuracy.

SEE US AT THE TOOL SHOW · BOOTH 1243

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TOOL PRODUCTS, INC.

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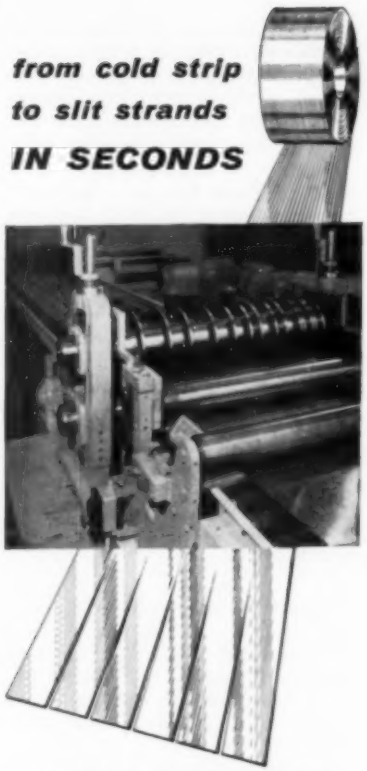
from cold strip to slit strands IN SECONDS



YODER ROTARY MULTIPLE SLITTERS

A Yoder slitter converts mill-width coils of flat-rolled metal into many variable-width strands in amazingly short time. Speed, coupled with great accuracy and low manpower requirements, makes a Yoder slitter an important factor in keeping production and overhead costs down.

Operated by only two men, the Yoder Type 3-48 slitter illustrated is designed to accommodate standard mill-width coils up to 48 inches wide, in a variety of metals and thicknesses. The slit strand widths can be held to within a .004" tolerance.

Even if your steel requirements are as little as 100 tons a month, the savings to be realized in time, manpower and raw material costs alone will pay for a Yoder slitter in the first few months of operation.

There is a Yoder slitter designed and engineered to meet your requirements, and to speed the delivery of "special" width stock in a wide range of large or small sizes. Send for your free copy of the fully-illustrated, 76-page booklet, "Multiple Rotary Slitting Lines."

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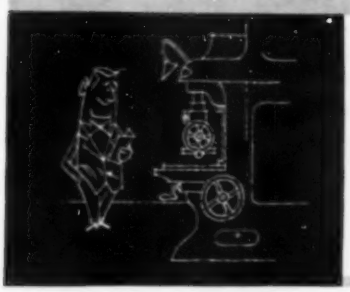

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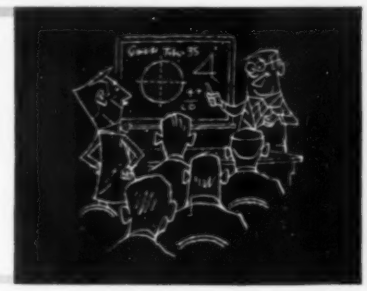

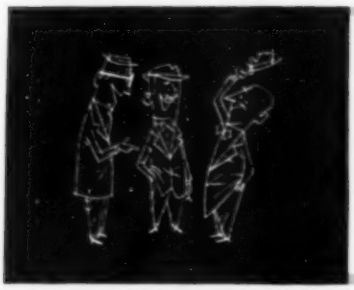

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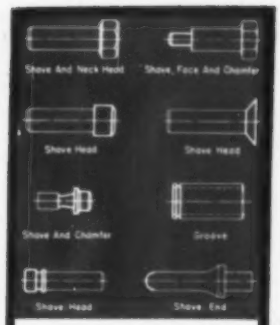
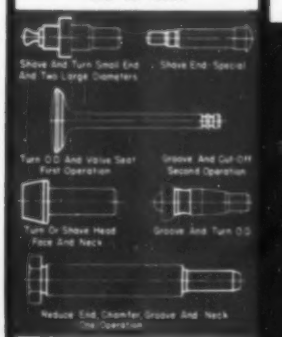
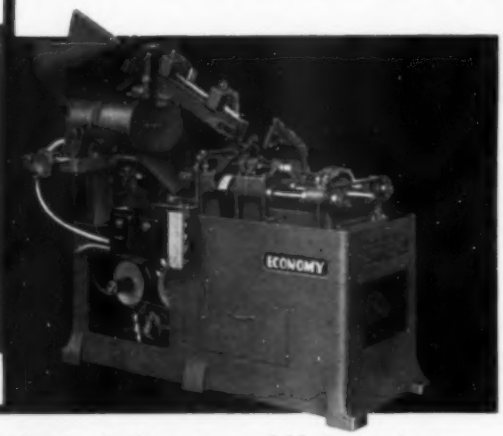


Typical parts machined on the "LS"-3600


Shave And Turn Small End And Two Large Diameters
Shave End Special
Turn OD And Valve Seat First Operation
Groove And Cut-Off Second Operation
Turn Or Shave Head Face And Neck
Groove And Turn OD
Reduce End, Chamfer, Groove And Neck One Operation

Illustrating operations completed on the S-4300

Face, Turn, Groove, Neck, Cut-off and Burnish BOLTS, AUTOMOTIVE VALVES, PROJECTILES & SIMILAR PARTS Automatically at High Production Rates on ECONOMY Automatic Shaving Machines



ECONOMY Automatic Shaving Machines are available in two sizes — the "LS"-3600 for body diameters up to ½" and lengths under heads from ½" through 4½" — the S-4300 for body diameters up to 1" and lengths ¾" to 6" under heads. Production rates for the standard "LS"-3600 range from 800 to 2400 finished parts per hour and the S-4300 from 450 to 1800 per hour.

Machines are fully automatic and parts flow from hopper to work pan. Simple adjustments plus easy, rapid set-ups enable operator to operate several machines.

For the ultimate in accuracy, high production and low costs investigate ECONOMY Automatic Shaving Machines.

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Automatic Pointing & Shaving Machines
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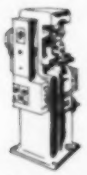
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Precision Marking Dies

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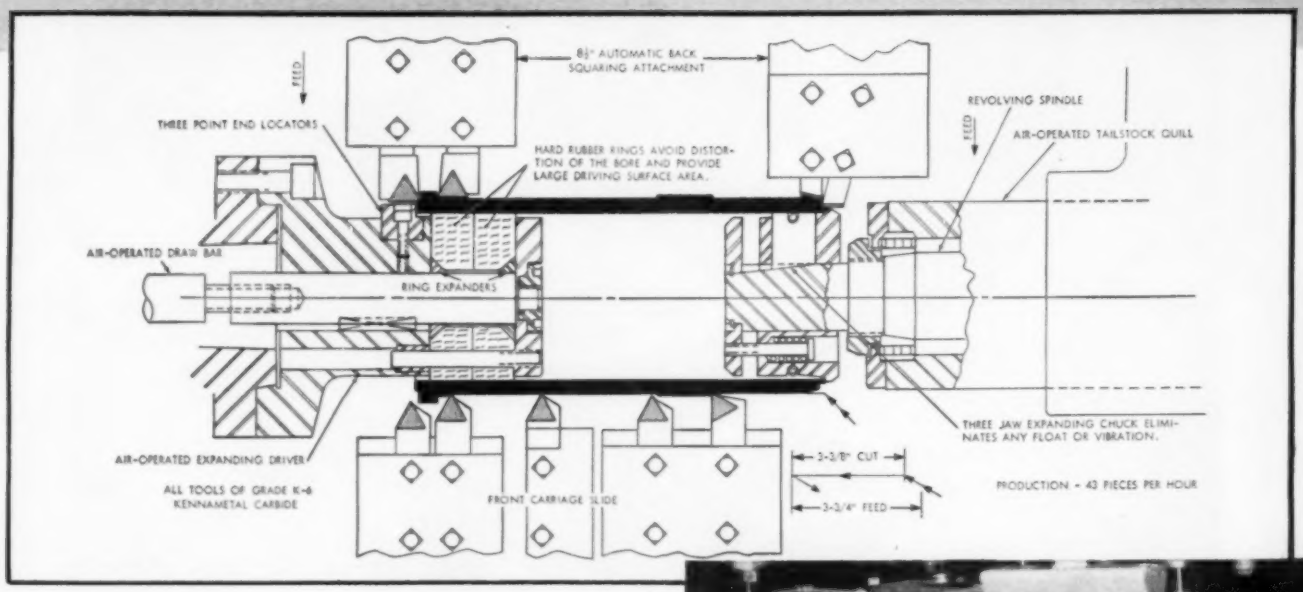
CYLINDER LINERS MACHINED ECONOMICALLY ON Lo-swing LATHES


FEED
8½" AUTOMATIC BACK SQUARING ATTACHMENT
THREE POINT END LOCATORS
HARD RUBBER RINGS AVOID DISTORTION OF THE BORE AND PROVIDE LARGE DRIVING SURFACE AREA.
REVOLVING SPINDLE
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RING EXPANDERS
THREE JAW EXPANDING CHUCK ELIMINATES ANY FLOAT OR VIBRATION.
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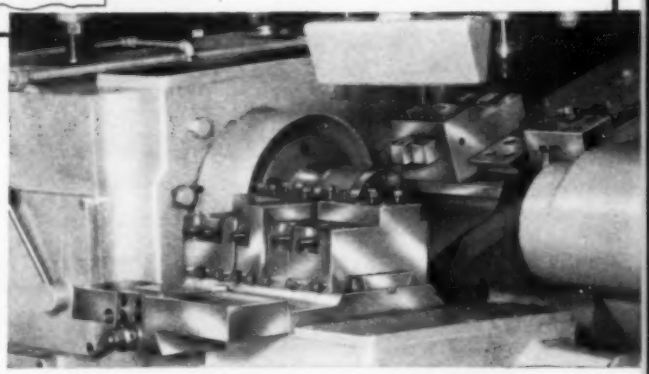
ALL TOOLS OF GRADE K-6 KENNAMETAL CARBIDE
FRONT CARRIAGE SLIDE
3-3/8" CUT
3-3/4" FEED
PRODUCTION - 43 PIECES PER HOUR



PROBLEM: To turn... without distortion... as well as face and chamfer, various cast, thin wall Diesel Cylinder Liners.

SOLUTION: The Model AR Automatic Lo-swing Lathe was selected for this job as it has: (1) *Necessary rigidity* for utilizing carbide tools. (2) *Simplified Change-Over Mechanism,* permitting all cams to be pre-set to graduated dials for length of cut. (3) *Instantaneous Tool Relief Control Mechanism,* which permits reversing carriage and slide feed movements without disturbing timing of slides or adjustment of the tools.

The Cylinder Liners are driven on the headstock end with a special driver which permits high cutting speeds and coarse carriage feeds without distortion. The tailstock end of the liner is supported with an expanding chuck operating under controlled air pressure to prevent distortion. All turning, facing and chamfering operations are performed simultaneously. The entire cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button.

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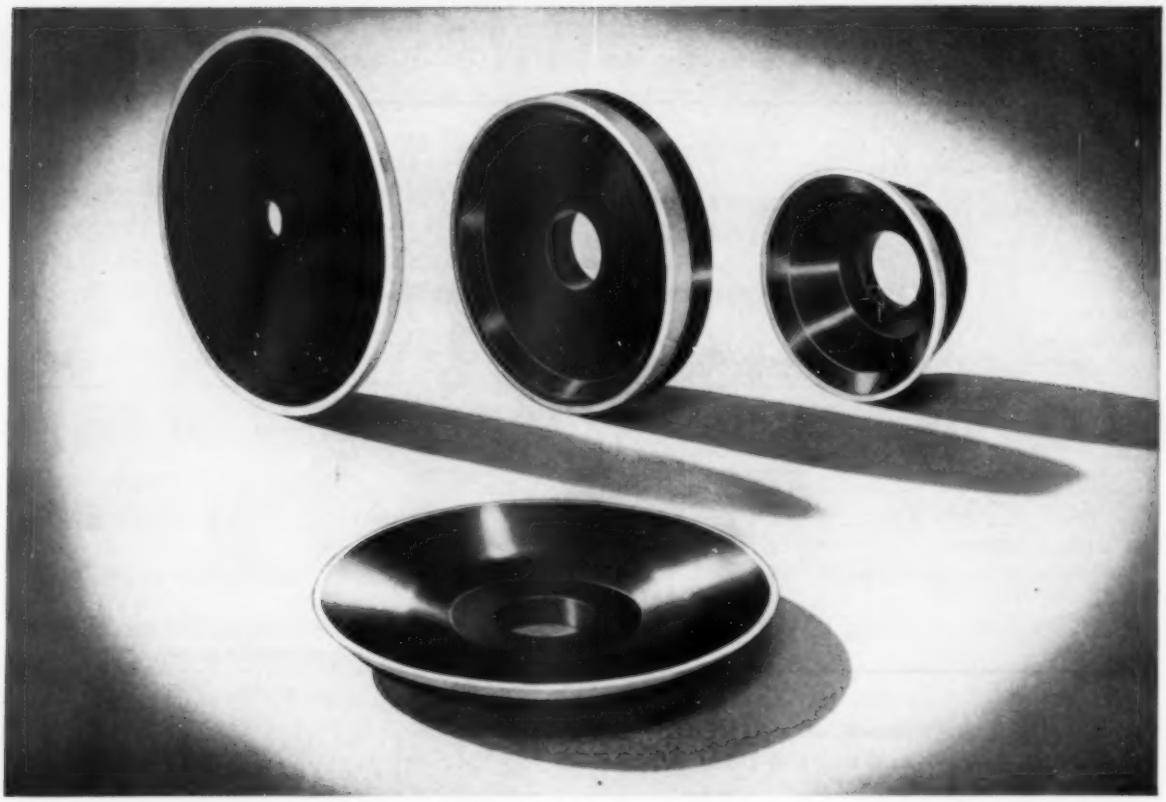

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Manhattan Diamond Wheels are made in a variety of surface-contact shapes . . . the *exact* size and shape for your specific grinding conditions. Diamond concentration and grit size are also determined by your job requirements. You get a higher degree of efficiency for all cutter, surface, cylindrical or internal grinding . . . "More Use per Dollar" . . . when you use Manhattan Diamond Wheels. Try them . . .

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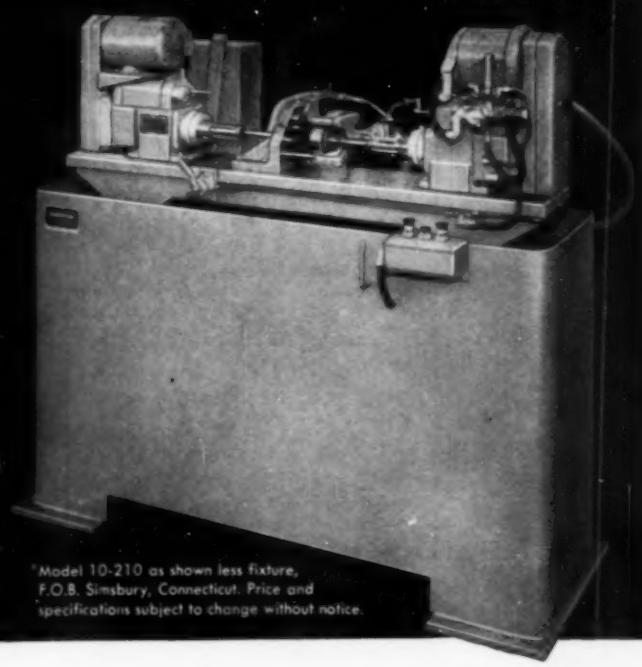
HARTFORD DOUBLE END MACHINE

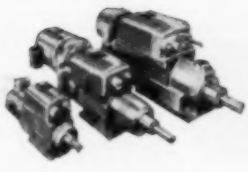
$3,565* Complete



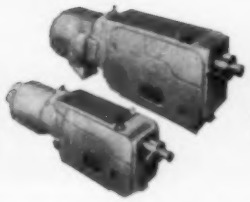
*Model 10-210 as shown less fixture, F.O.B. Simsbury, Connecticut. Price and specifications subject to change without notice.

- Opposed operations simultaneously
- Quick change of stroke, feed rate, spindle speed and unit position
- Handles parts up to 28" long
- Available with manual or automatic interlocked cycle
- Coolant tank, coolant pump, chip pan and coolant troughs integral with base
- Drill capacity to 5/16" in mild steel with 19-150 Unit
- Tapping capacity 3/8" with a maximum stroke of 1 1/2"
- Use with small index table, manual or air clamp fixtures, hopper load devices or vibration feeders
- Adaptable to multiple spindle head applications
- Performs two operations per hole with index table
- Inexpensive, fast, flexible centering operations
- Available as basic machine — completely tooled or as separate components

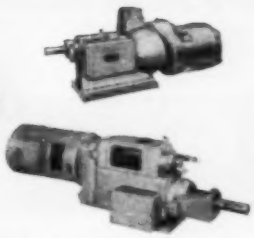
Rectangular Bases — 8" x 60" finished mounting pad accommodates a variety of drilling, boring or tapping units. Coolant tank with pump mounting flange, drain port, chip pan and large coolant troughs included. Adaptable to small index tables, air clamps or other part locators.



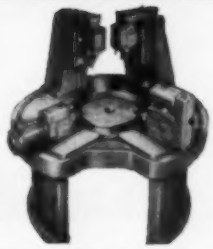
Automatic Drilling and Tapping Units — The Hartford Model 19-150 Quill Type Drill Unit is ideally suited as a working unit on the Double End Machine for production drilling, tapping, reaming, spot-facing, centering, milling, chamfering and countersinking. Other Hartford Units can be readily adapted also.



Automatic Cam Feed Drilling Units—Two models of these mechanical feed units are available. Designed for use with multiple head as well as single spindle applications, these electric clutch units are compact, dependable and fast cycling. They provide positive accuracy on long run jobs.



Automatic Lead Screw Tapping Units—No. 22 unit, above, features lead change through gearing from master lead screw. No. 19-175 unit, below, features variable quick advance stroke before starting lead screw spindle.



Other Hartford standard basic components including circular bases, straight post columns, tunnel columns and unit adapters can be combined with standard Hartford drilling and tapping units for assembly into production machines such as the 65" horizontal indexing machine shown above.

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Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

Machine Tool Division
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Send me complete information on Model 10-210 Machine and other machine components.

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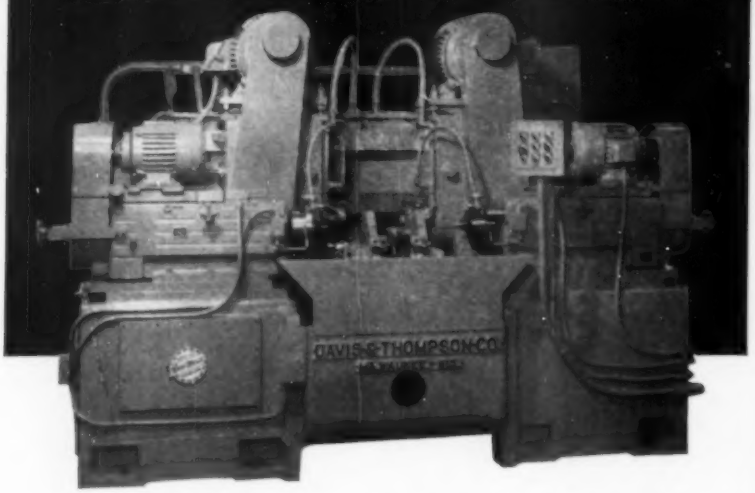
Basic Standard Machines *PLUS* D&T Engineering Will Give You More Profitable Production . . .



HERE'S WHY: Although this machine has been adapted to milling and centering of small shafts, its basic design lends itself to other operations through the addition of various types of heads as well as multiple spindle drill heads.

Feeds and speeds are variable. The hydraulically operated machine table is equipped with an air-operated fixture which is electrically controlled for either automatic or mechanical cycling.

If you need production with a minimum capital outlay, it will pay you to call in a D & T production engineer. There is no obligation for this service.

ADDITIONAL INFORMATION

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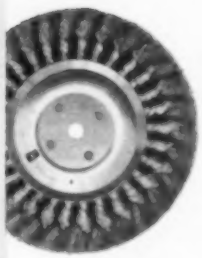

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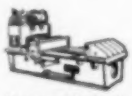

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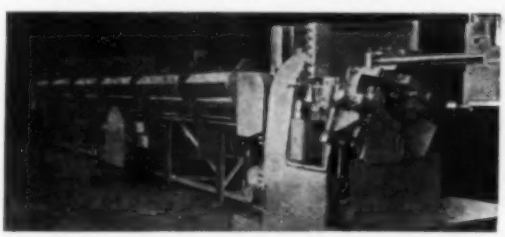

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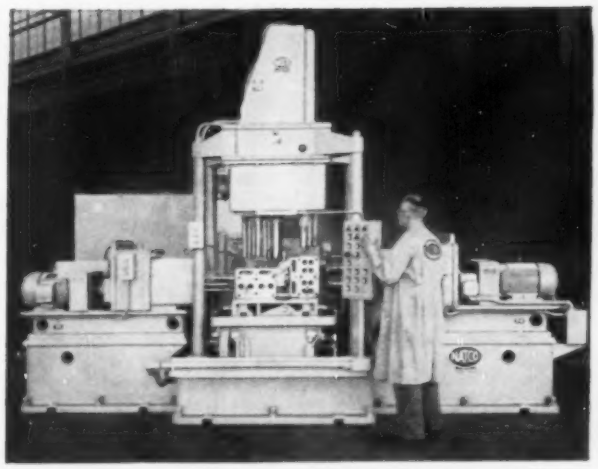

Four-way tapping machine uses 36 lead-screw spindles to process 30 diesel cylinder heads per hour. Four-position fixture holds two parts. Job No. 3719.

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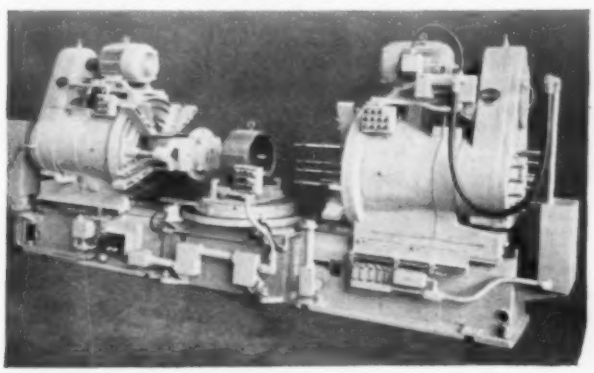

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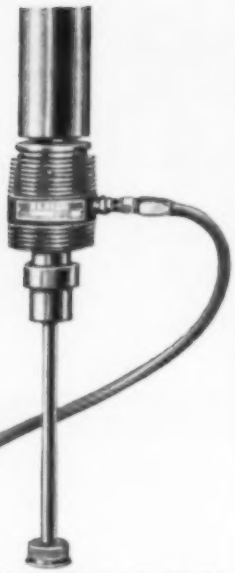

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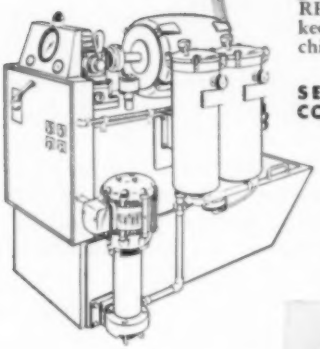

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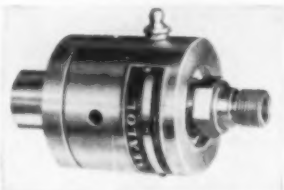

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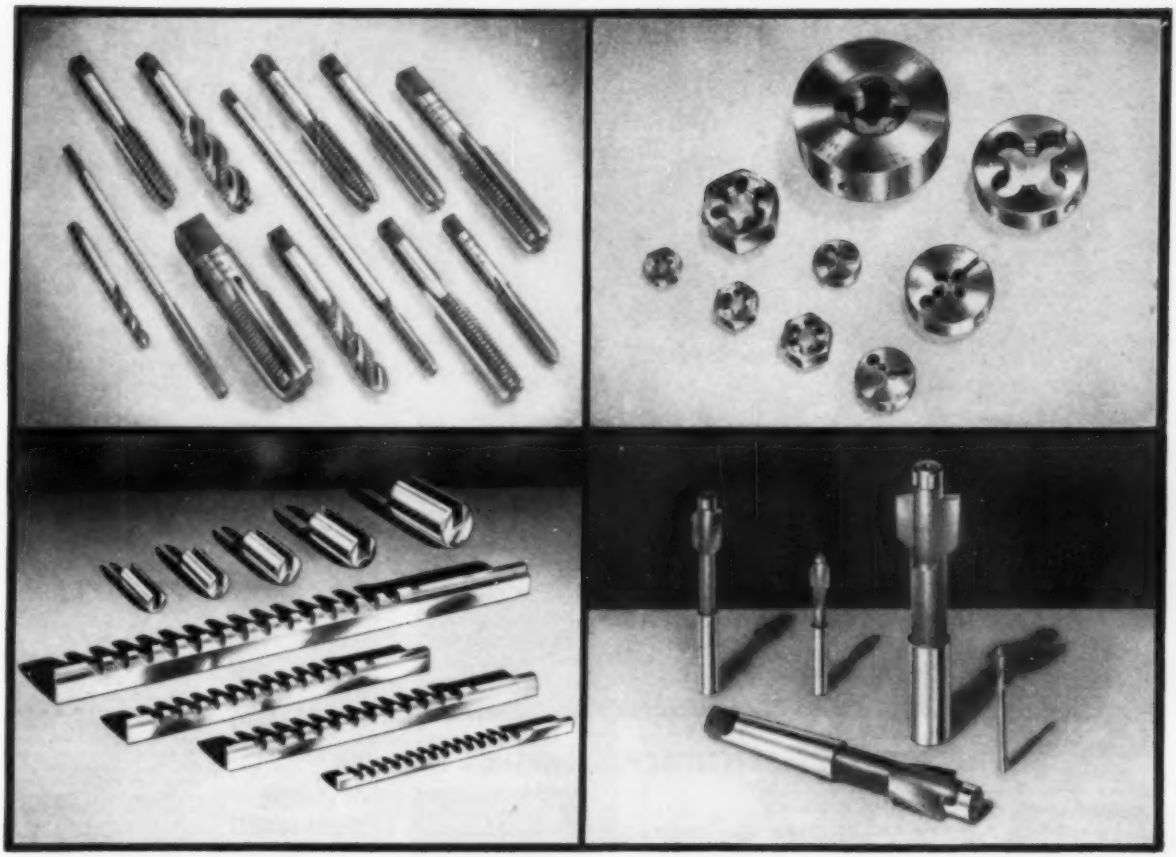

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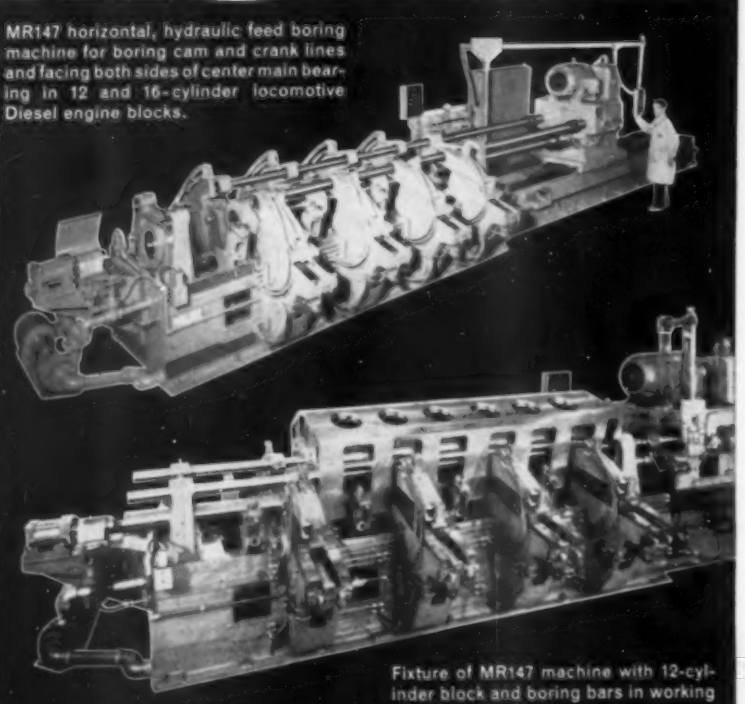
MR147 horizontal, hydraulic feed boring machine for boring cam and crank lines and facing both sides of center main bearing in 12 and 16-cylinder locomotive Diesel engine blocks.



Fixture of MR147 machine with 12-cylinder block and boring bars in working position. Cam bars run in hydraulic powered bushings which are retracted when loading fixture.

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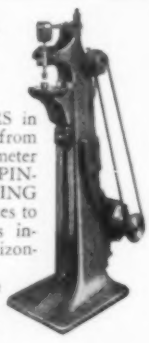

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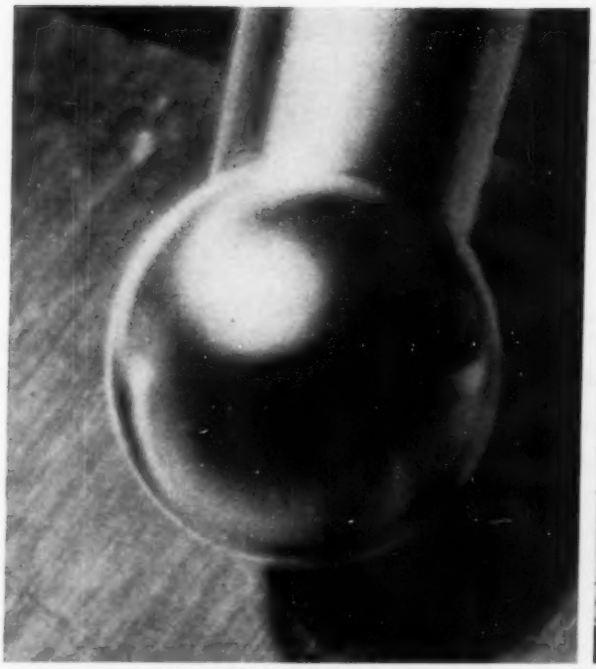

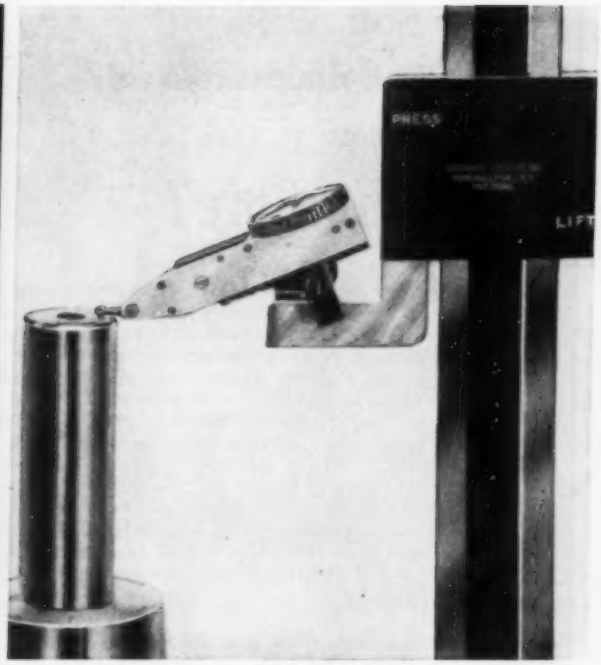

(Left) CHECK MASTER contact point on work piece shown 22 times actual size. To see the smallest variations CHECK MASTER will detect, illustration would need to be 500 times actual size. (Right) CHECK MASTER on STANDARD Comparator Height Gage gives "tenth" accuracy.

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	STANDARD CHECK MASTER	Make A	Make B	Make C	Make D	Make E
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Bearings Removable	ALL	Some	Some	None	ALL	ALL
Pivot Ends Covered	YES	YES	No	No	No	YES
Ratchet Contact Point	YES	YES	YES	No	YES	No
Contact Pressure (gr.)	21-21	23-33	23-33	23-23	45-49	28-38
Contact Pressure Equal in Both Directions	YES	No	No	YES	No	No
On-Center Mounting Vertical & Horizontal	YES	No	Vert. Only	No	Vert. Only	No
Absence of Reversing Lever	YES	No	No	YES	No	No
Total Weight (grams)	29	42	33	70	77	35
Hand Rotation Always Clockwise	YES	No	No	YES	No	No
.001" & .0001" Convertible	YES	No	No	No	No	No

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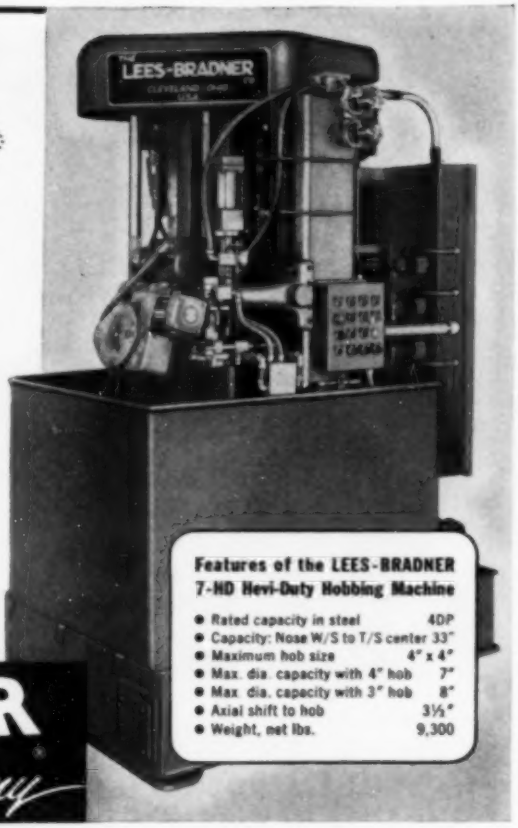
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Maximum hob size 4" x 4"
Max. dia. capacity with 4" hob 7"
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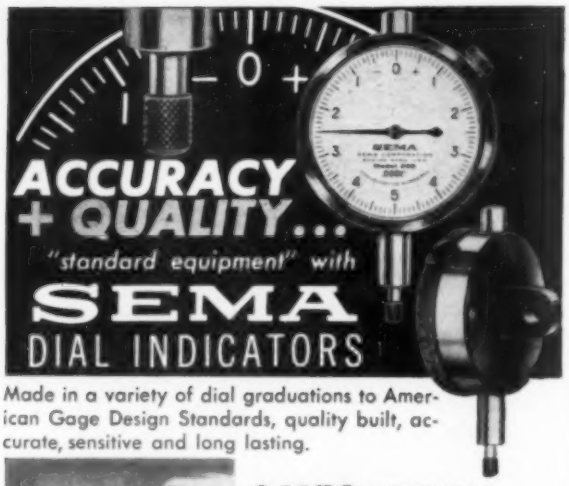

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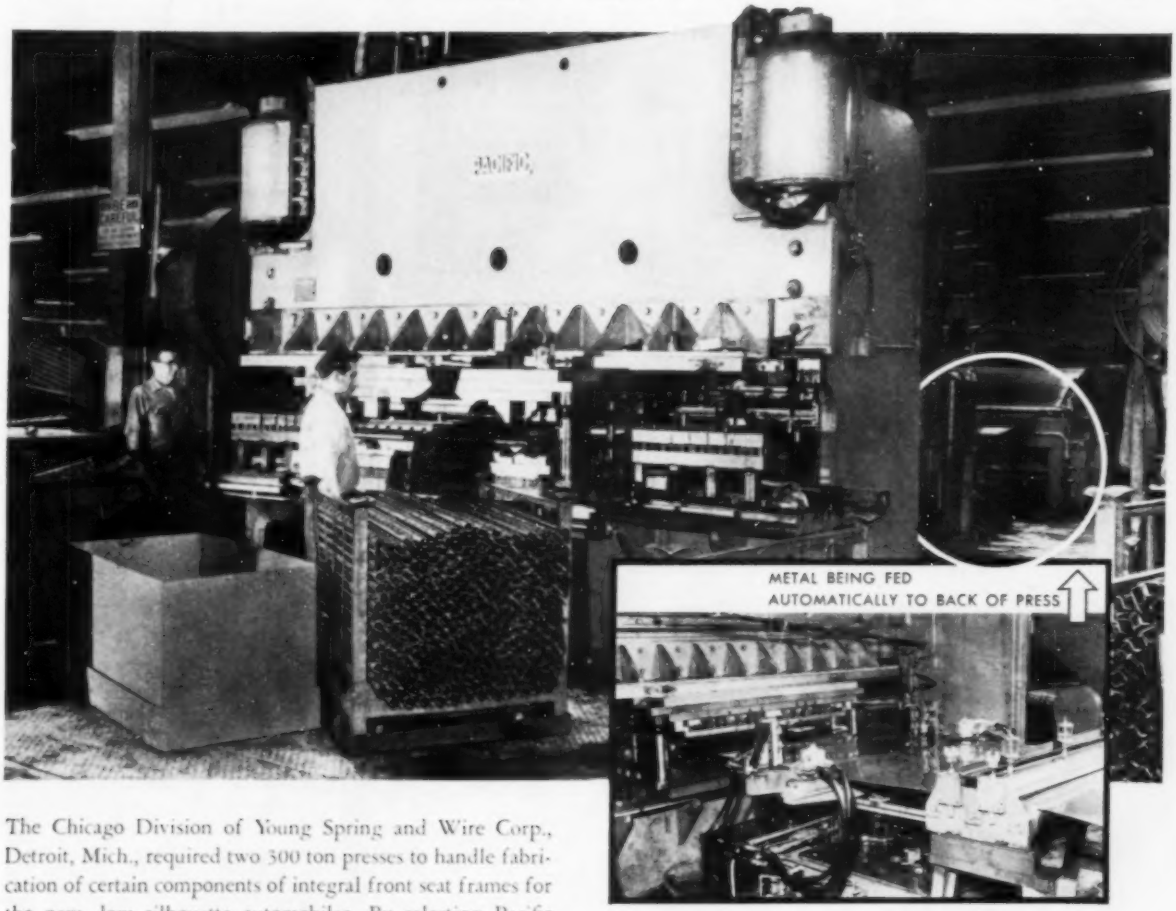

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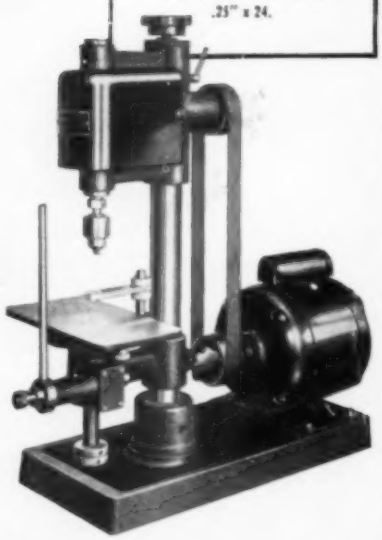

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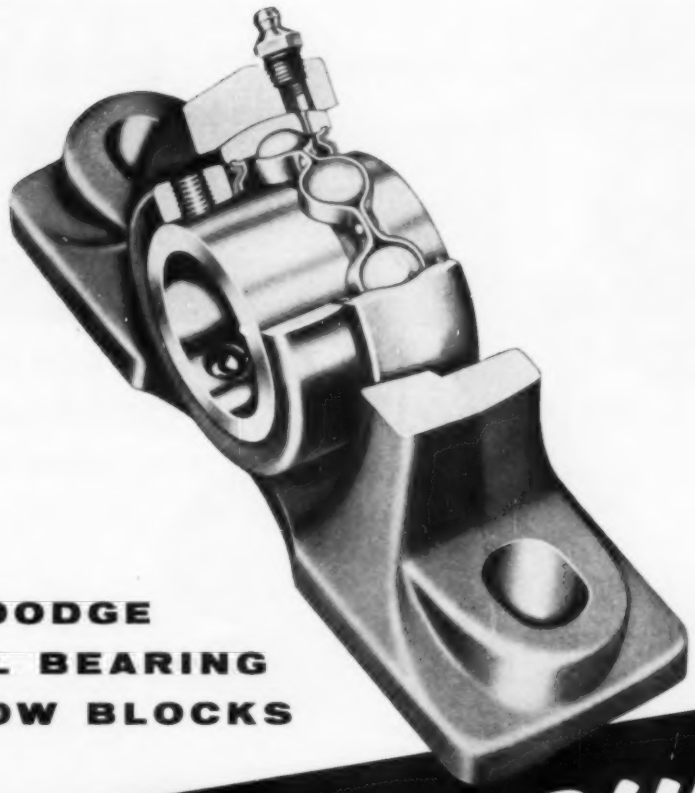

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SMALL DRILLS MUST BE HELD IN PRECISION COLLETS TO ASSURE ACCURACY

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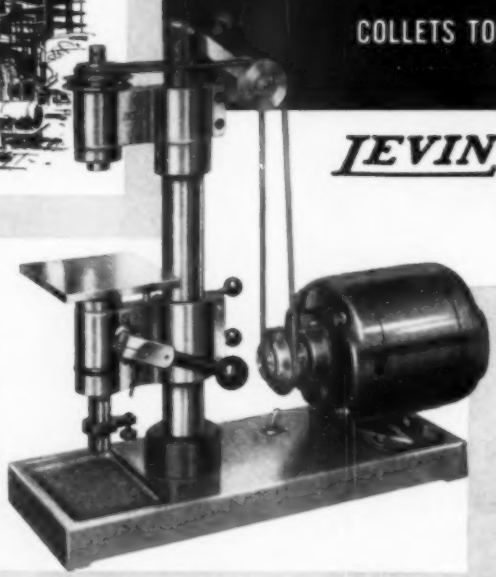

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Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

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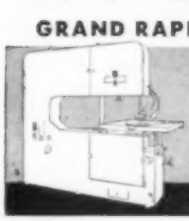

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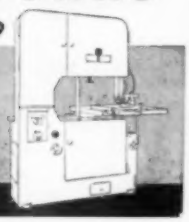

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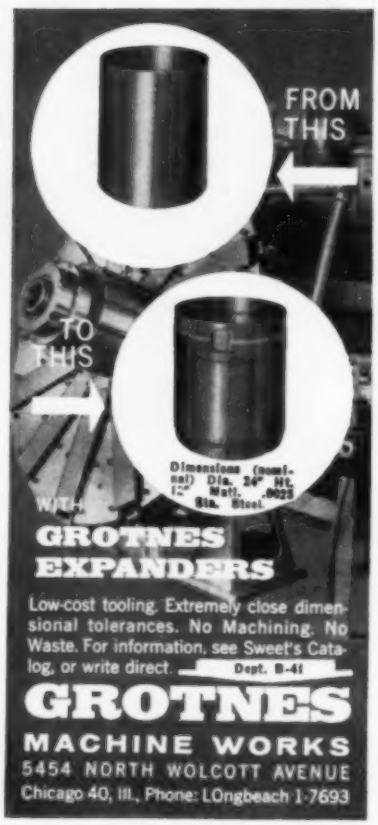

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No. 125 Marken Marking Machine, m.d.
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Pratt & Whitney Standard Measuring Machine, 36" capacity
Type 114CB Moline Tool Boring Machine, 2 spin dle type, m.d.
15" Gleason Quenching Press
LeRoi Electric Power Plant
38" Face Plate, lathe, taper nose key mounted, new
Hanchett Grinding Head, vertical type for mounting on planer rail
16"x60" O.S. Walker Magnetic Chuck
Clamping Assembly to fit a 6.2 Denver Acme Turret Lathe
1 ton Shaw Electric Cable Hoist
Brown & Sharpe Universal Attachment, for use on 2A Brown & Sharpe Miller
63" Walker Rotary Magnetic Chuck, 230 volt D.C. new
Portable Greasing Machine, motor operated
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2 spindle Keller Machine
Model 75M, 75 ton Lompco Hand Operated Hydraulic Press, new
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King Boring Mill Table, 32" diameter, 4 jaw independent chuck, new
Jones & Lamson Automatic Die Head Hartness No. 7H
9x9 Curtis Model A Air Compressor, flat belt drive
Type 40, Model 73 BH, 2 stage Ingersoll Rand Air Compressor, m.d.
No. 26 Norton Hyprolap, m.d., late

AUTOMATICS

9/16" Cleveland Model A, m.d., 1943
1-1/16" Cleveland Model B, m.d.
4 spindle 1⅝" Cleveland, Model M, m.d.
4 spindle 2" Model K Cleveland, m.d.
2½" Cleveland, m.d., Model A
No. 4D Potter & Johnston ,m.d.
No. 5 DELX Potter & Johnston, m.d., late
No. 5D2 Potter & Johnston, m.d.
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1½" Landis 2 spindle, m.d.
1½" Landis Bolt Threading Machine, Double Head, m.d.

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No. 32 Giddings & Lewis Table Type, m.d.
No. 1 Cleveland Horizontal Boring, Drilling & Milling, m.d.
3½" bar Cincinnati Gilbert Horizontal Boring, Drilling and Milling, floor type
4½" bar, Model 72, Niles-Bement-Pond, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Sellers Floor Type, m.d.
Barrett Double End, 5" and 7" spindle, m.d.
Floor Plates—all sizes

VERTICAL BORING MILLS

16" Bullard Mult-Au-Matic, m.d.
24" Bullard Spiral Drive, m.d., 1943
36" Bullard, m.d., late, 1944
42" King, m.d., (Two 1945 & 1948)
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60" Bullard, m.d.
102" Niles Wheel Turning Boring Mill

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75 H.P. LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke LaPointe Single Ram Vertical Surface Broach, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dup. Ram Surface Hy. Broach
No. 4L LaPointe Horizontal, m.d., 1944

RADIAL DRILLS

4'-13" col. American Hole Wizard, m.d.
4'-13" col. Foodick, 1944
4'-15" col. Cincinnati-Bickford, m.d.
5'-13" col. Cincinnati Bickford Super Service, m.d.
5'-15" col. American, m.d. oo arm
7'-16" col. American Triple Purpose, m.d.
7'-17" col. American Hole Wizard, m.d.
8'-17" col. Drosos, gear box m.d.
Baush Radial Drilling & Tapping Machine, m.d.

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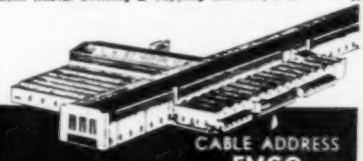

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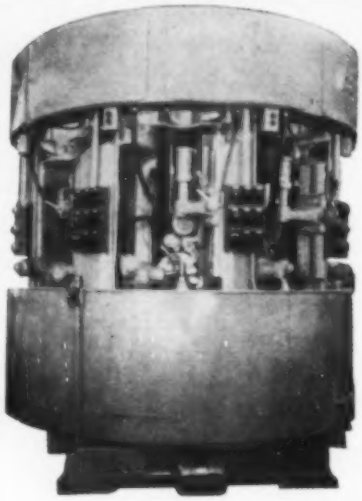

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3 x11", 3"x13" CINC-BICKFORD Super Service Motor on arm, Radial Drills.

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1¾" 5 spindle Warner & Swasey automatic screw machine, MD
2" RB6 National Acme Gridley multiple spindle bar machine
No. 3 S Gisholt dynetric balancer, late
10 ton 66" stroke Oilgear type XD-20-66 double slide vertical surface hydraulic broach
No. 2A Modern automatic cut-off machine, new 1951
455 CFM 8" x 10" x 13" Type XRE plate valve Ingersoll Rand two stage air compressor
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Model BL 2416 Pratt & Whitney keller, 3 spindle head, duplicator or engraver
10" x 18" Norton type C semi-automatic hydraulic cylindrical grinder (3)
30" No. 84A Gardner opposed wheel double disc grinder, new 1947
36" No. 18 Blanchard vertical spindle 25 HP MD surface grinder
No. 1 Baker keyseater tilting sliding table
15", 30" centers 6' bed Model AA Reed Prentice 16 speed geared head engine lathe
Model 4D Potter & Johnston high speed automatic turret lathe, hard ways, Timken bearing spindle
No. 33 Sundstrand Model 33-1536 Fluidscrew Rigidmil bed type production mill
3¾" No. 5 Defiance horizontal boring, milling and drilling machine
10½" x 10½" No. 3 Match & Merryweather circular cold saw
4' x 9" Cinci-Bickford radial
25" No. 2 Avey 2B-MA6 Uprite drill, No. 2MT—late
3¾" bar Defiance table type boring mill, 1942

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3'11" column American Holewizard Radial Drill, motor on head, 12 speeds, late.
4'11" column American Holewizard Radial Drill, motor on head, 12 speeds, late.
1½B Pratt & Whitney Jig Borer, new 1945; late type, table 12" x 24".
10" x 36" Norton Hydraulic Surface Grinder, late type, table size 10" x 36¾".
16" x 40" x 90" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 28" in gaps, mechanical feed, late type.
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32" x 252" American Pacemaker, new 1948, 40 HP AC motor, 18 speeds, hardened ways.
36" x 40" American Internal Face Plate Drive G.H. Lathe, 33' centers 2 carriages.
36" Bullard Spiral Drive Vertical Boring mill, 4 jaw chuck table with jaws.

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SEARCHLIGHT EQUIPMENT SPOTTING SERVICE, c/o American Machinist

Classified Advertising Division, P.O. Box 12, N. Y. 36, N. Y.

Your requirements will be brought promptly to the attention of the equipment dealers advertising in this section. You will receive replies directly from them.

Searchlight Equipment Spotting Service, c/o Classified Advertising
AMERICAN MACHINIST, P. O. Box 12, N. Y. 36, N. Y.

Please help us locate the following equipment:

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NAME ..... TITLE ..... COMPANY .....

STREET ..... CITY ..... ZONE ..... STATE .....

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The Blanchard method of die sharpening is unequalled for speed, safety and economy. All of the dies shown are sharpened on a Blanchard No. 18 Surface Grinder with equal ease.

The rotary work motion of the Blanchard, with the wheel covering the entire surface at each revolution, enables the operator to remove the amount of stock to sharpen the die and no more! This saves time and increases the life of the die, too.

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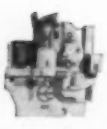
Many shops use their Blanchards for die sharpening as well as all other surface grinding required in their manufacturing. The 3 Blanchards shown below cover work requirements from finishing tiny gears to roughing steel plates 84" across corners.

Write today for your free copy of WORK DONE ON THE BLANCHARD, Fifth Edition and "the Art of Grinding", Fourth Edition.

BLANCHARD

THE BLANCHARD MACHINE COMPANY
64 State Street, Cambridge, Massachusetts, U. S. A.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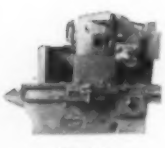
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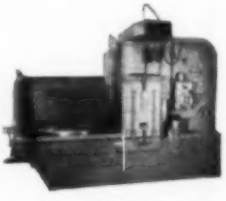
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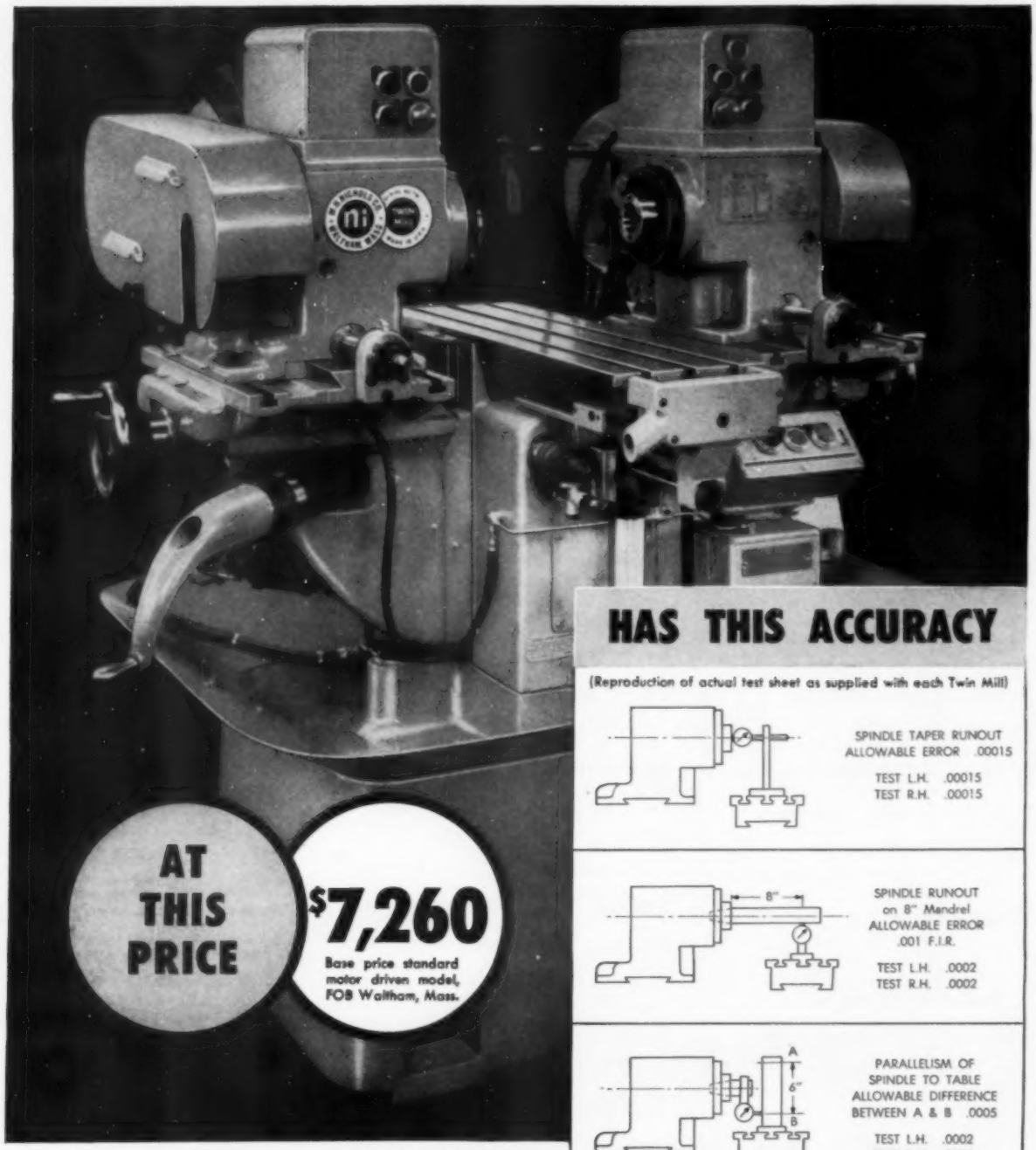

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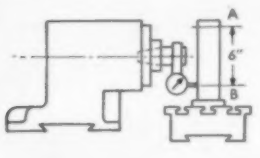

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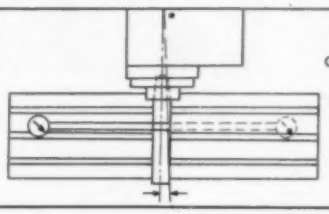

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